HOKKAIDO UNIVERSITY

Title	DESCRIPTIONS OF THIRTEEN NEW SPECIES OF THE GENUS CHRYSOCERCOPS KUMATA ET KUROKO,1988,FROM MALAYSIA AND NEPAL (LEPIDOPTERA : GRACILLARIIDAE)
Author(s)	KUMATA, Tosio
Citation	Insecta matsumurana. Series entomology. New series, 46: 73-131
Issue Date	1992-01
Doc URL	http://hdl.handle.net/2115/9862
Right	
Type	bulletin
Additional Information	

Instructions for use

Hokkaido University Collection of Scholarly and Academic Papers : HUSCAP

INSECTA MATSUMURANA

NEW SERIES 46 : 73-131 JANUARY 1992

DESCRIPTIONS OF THIRTEEN NEW SPECIES OF THE GENUS CHRYSOCERCOPS KUMATA ET KUROKO, 1988, FROM MALAYSIA AND NEPAL (LEPIDOPTERA : GRACILLARIIDAE)

By TOSIO KUMATA

Systematic and Ecological Surveys on Some Plant-Parasitic Microarthropods in Southeast Asia, Scientific Report No. 12.
Research Trips for Agricultural and Forest Insects in the Subcontinent of India, Scientific Report No. 45.

Abstract

KUMATA, T. 1992. Descriptions of thirteen new species of the genus *Chrysocercops* Kumata et Kuroko, 1988, from Malaysia and Nepal (Lepidoptera : Gracillariidae). *Ins. matsum. n. s.* 46 : 73-131, 31 figs. (22 text-figs, 9 pls.).

Thirteen new species of the genus *Chrysocercops* are described : *C. argentata* (associated with *Shorea robusta* and *Hopea nutans*) from Nepal and Malaysia, *C. leprosulae* (*Shorea leprosula*) from Malaysia, *C. vaticae* (*Vatica bella*) from Malaysia, *C. azmii* (*Shorea maxonia*) from Malaysia, *C. neobalanocarpi* (*Neobalanocarpus heimii*) from Malaysia, *C. hopeella* (*Hopea nutans* and *H. odorata*) from Malaysia, *C. lithocarpiella* (*Lithocarpus rassa*) from Malaysia, *C. squamosa* (*Vatica pallida* and *V. pauciflora*) from Malaysia, *C. shoreae* (*Shorea materialis*) from Malaysia, *C. melastigmata* (*Hopea nutans*) from Malaysia, *C. thapai* (*Shorea robusta*) from Nepal, *C. malayana* (*Shorea acuminata, S. bracteolata,* and *S. leprosula*) from Malaysia, and *C. pectinata* (*Dipterocarpus grandifolius*) from Malaysia. Genitalia of both sexes and fore wings are illustrated for all these species and the type-species, and wing venations and larval chaetotaxies are illustrated for some species. Moreover, leaf-mines are shown by photographs for some species.

The known host plants suggest that the genus is mainly distributed in Southeast Asia, especially in the plant geographical region Malesia. Generic characters in the wing venation and larval chaetotaxy are discussed. Two species-groups based on the colour-pattern, the *castanopsidis*-group and *malayana*-group, are proposed as main divisions within the genus. A key to the species (and the type-species in addition) is given.

Author's address. Entomological Institute, Faculty of Agriculture, Hokkaidô University, Sapporo, 060 Japan.

Supported by Grants-in-Aid, Ministry of Education, Science and Culture, Japan, Nos. 58041001, 61041003 and 02041004 (International Scientific Research Program).

Contents

Introduction 75
Materials, methods and type-depositories 75
Genus *Chrysocercops* Kumata et Kuroko 75
Species-groups of the genus *Chrysocercops* 76
Key to the species of the genus *Chrysocercops* 78
Descriptions of new species
Chrysocercops argentata sp. nov. 80
Chrysocercops leprosulae sp. nov. 84
Chrysocercops vaticae sp. nov. 87
Chrysocercops azmii sp. nov. 91
Chrysocercops neobalanocarpi sp. nov. 94
Chrysocercops hopeella sp. nov. 97
Chrysocercops lithocarpiella sp. nov. 99
Chrysocercops squamosa sp. nov. 101
Chrysocercops shoreae sp. nov. 104
Chrysocercops melastigmata sp. nov. 107
Chrysocercops thapai sp. nov. 110
Chrysocercops malayana sp. nov. 113
Chrysocercops pectinata sp. nov. 116
Acknowledgements 119
References 119
Plates 120

Introduction

Up to the present, the genus *Chrysocercops* Kumata et Kuroko, 1988, has been represented by the type-species alone, which is known from Japan. In this paper 13 new species are added to the genus on the basis of specimens collected mostly from Malaysia in connection with the project "Systematic and Ecological Surveys on Some Plant-Parasitic Microarthropods in Southeast Asia", 1986 and 1990, and partly from Nepal under the project "Research Trips for Agricultural and Forest Insects in the Subcontinent of India", 1983.

Twelve of the 13 species described herein are associated with various species of the family Dipterocarpaceae, while the other one occurs on a fagaceous plant, agreeing thereby with the type-species. This suggests that the genus *Chrysocercops* may be rich in species in Southeast Asia, especially in Malesia west of Wallace's Line, where dipterocarps dominate the canopy of most lowland forests (Symington, 1943 ; Good, 1969 ; Ashton, 1988).

Materials, methods and type-depositories

The specimens used were all collected by me and were reared from larvae mining in leaves of their food plants when I stayed in Malaysia and Nepal in connection with the projects mentioned above. In breeding larvae I usually used small plastic cases corrugated with shallow furrows on the wall. Pupation often took place in a furrow, and adults successfully emerged from cocoons made in furrows rather than on other parts such as dead leaves. Adults emerged were killed by ammonium, and, immediately after, pinned and settled on wing-spreading boards under a portable stereomicroscope. In "Specimens examined" numerals placed within parentheses after plant names are breeding numbers.

A stereomicroscope with an ocular micrometer was used to measure specimens. Expanse of wings was measured between the apices of fore wings including cilia in specimens with expanded wings. Length of fore wing measured from the base to the apex is given for specimens with unexpanded wings.

Genital organs used for observations and drawings are stained with both chlorazol black E and acid fuchsin and mounted on slide with Canada balsam or Eukitt. For the determination of wing venations and larval chaetotactic patterns material was processed likewise.

Depositories of the type-specimens are indicated under "Specimens examined" as follows : EDAK = Entomological Division, Department of Agriculture, Kathmandu ; EIHU = Entomological Institute, Faculty of Agriculture, Hokkaidô University, Sapporo ; and FRIM = Forest Research Institute of Malaysia, Kuala Lumpur.

Genus Chrysocercops Kumata et Kuroko

Chrysocercops Kumata et Kuroko, 1988, Ins. matsum. n. s. 40 : 53 [type-species : *Chrysocercops castanopsidis* Kumata et Kuroko, 1988].

This genus was originally erected to receive the type-species alone. At that time, however, the description was partly based on five other species feeding on dipterocarps in Nepal and Malaysia. Eight further species, which occur in Malaysia

on dipterocarps and *Lithocarpus*, are available to this study. Based on all these 14 species the concept of the genus requires some modifications.

The genus is characterized by the absence of vein R_1 on the fore wing except for two species, *C. melastigmata* (sp. nov.) and *C. thapai* (sp. nov.), in which R_1 is represented by a short vein (Figs. 24 : C & D). These species, however, undobtedly belong to the present genus on the basis of other features such as head, legs and genitalia of both the sexes. The vein in these two species seems to be vestigial, because it has no terminal sensory organs. The complete radial, medial and cubital veins are usually accompanied by a pair of campaniform sensilla, which are placed on the lower side near the wing-margin as in other Lepidoptera (Baus, 1936).

Larvae have been available for study in three species : the type-species, *C. azmii* (sp. nov.) and *C. malayana* (sp. nov.). *C. azmii* is very different from the other two in lacking seta XD2 on the prothorax and MD1 on the ninth abdominal segment (Fig. 25 : A). On the other hand, *C. malayana*, which is not to be placed in the same species-group with the type-species and *C. azmii* so far as based on adult features, shows the same chaetotactic pattern with that of the type-species (Fig. 25 : B). In reclassifying the *Acrocercops*-group of Japan, Kumata et al. (1988) studied the larval chaetotaxy and found that there is no such exception in Japanese species. However, the case mentioned above suggests that the chaetotaxy is not always stable. The classification of the *Acrocercops*-group based on both larval and adult characters may not be a simple work to be accomplished by formal comparisons.

Species-groups of the genus *Chrysocercops*

The fourteen species of the genus, including the type-species, can be divided into two groups based on the colour-pattern of the fore wing as mentioned in the key. Ten species form the *castanopsidis*-group, which is characterized by the simple cilia without any fringe-line in fore wing. The other four belong to the *malayana*-group, which is distinct in having two blackish fringe-lines in cilia of the fore wing. However, the genital structures do not always follow this division. For example, in the *malayana*-group, *C. melastigmata* is unique in having no pecten or comb on the male valva, agreeing in this character with all the members of the *castanopsidis*-group. In this paper the species-groups based on the colour-pattern are adopted rather for practical use.

I. The *castanopsidis*-group.

This group contains the following ten species : —

1. *C. argentata* (sp. nov.) feeding on *Shorea* in Nepal and on *Hopea* in Malaysia.
2. *C. leprosulae* (sp. nov.) on *Shorea* in Malaysia.
3. *C. castanopsidis* Kumata et Kuroko on *Castanopsis* in Japan.
4. *C. vaticae* (sp. nov.) on *Vatica* in Malaysia.
5. *C. azmii* (sp. nov.) on *Shorea* in Malaysia.
6. *C. neobalanocarpi* (sp. nov.) on *Neobalanocarpus* in Malaysia.
7. *C. hopeella* (sp. nov.) on *Hopea* in Malaysia.
8. *C. lithocarpiella* (sp. nov.) on *Lithocarpus* in Malaysia.
9. *C. squamosa* (sp. nov.) on *Vatica* in Malaysia.
10. *C. shoreae* (sp. nov.) on *Shorea* in Malaysia.

The known members of the *castanopsidis*-group are apparently mere fragments and may not be sufficient for making a further division. However, they can be subdivided into several subgroups on the basis of the genital structures.

The first three species, *C. argentata, C. leprosulae* and *C. castanopsidis*, may form a subgroup characterized by the following combination of characters: male valva with ventral margin smooth, without a distict incision or concave between cucullus and sacculus; aedeagus simply tubular, never swollen beyond middle; female signum lined with short and triangular spines. Among them *C. argentata* is more related to *C. leprosulae* than to *C. castanopsidis* in the basally widened cucullus and the straight corpus bursae.

C. vaticae and *C. azmii* are very similar and form another subgroup. They have the following characters in common: complicated aedeagus with two slender projections and a bundle of hair-like spines; seventh abdominal segment of male with a bundle of bristly scales at mid-ventrum of caudal margin; wrinkled seventh abdominal sternite of female; and V-shaped arrangement of slender and long spines of signum.

C. neobalanocarpi, C. hopeella, C. lithocarpiella and *C. squamosa* may form a third subgroup. They are characterized by the valva with a more or less distinct incision or concave between the slender cucullus and the widened sacculus, and by the aedeagus with a rather large plate-like cornutus in addition to minute, needle-shaped ones. Moreover, *C. lithocarpiella* and *C. squamosa* are more related to each other than to *C. neobalanocarpi* and *C. hopeella* in having deformed, more or less swollen, setae on the inner surface of the valva.

C. shoreae is isolated by the genital plate around the female ostium bursae being unique in shape.

It may be noteworthy that the members of the same subgroup are associated with plants of different genera when occurring in the same area; when distributed in different localities they may be associated with plants of the same genus as in the case of *C. argentata* and *C. leprosulae.*

II. The *malayana*-group.

This group includes the remaining four species: —

11. *C. melastigmata* (sp. nov.) on *Hopea* in Malaysia.
12. *C. thapai* (sp. nov.) on *Shorea* in Nepal.
13. *C. malayana* (sp. nov.) on *Shorea* in Malaysia.
14. *C. pectinata* (sp. nov.) on *Dipterocarpus* in Malaysia.

Of the species mentioned above, *C. thapai* and *C. malayana* are very similar to each other, and are distinguished from the other species by the valva with an elongate comb, of which the short teeth are arranged along the apical and ventral margins of the produced sacculus. They may form a subgroup in the species group of *malayana.*

In genital structures *C. melastigmata* and *C. pectinata* are unique species in the group. In *C. melastigmata* the valva is simple in form without any comb or pecten as mentioned already, whereas in *C. pectinata* the valva has a comb similar to that seen in the members of the genus *Acrocercops.*

Key to the species of the genus *Chrysocercops*

1. In colour, cilia of fore wing simple, without any fringe-line. (*Castanopsidis*-group.) 2
- Cilia of fore wing with two blackish fringe-lines, one running in parallel with termen and the other forming a short hook. (*Malayana*-group.) 11
2. A silvery-white, black-margined spot placed on costa around or before middle of fore wing in addition to other markings. 3
- A silvery-white spot absent in fore wing 9
3. Fore wing with a dark fascia at middle beyond silvery-white costal spot, the fascia being suffused with black scales on its costal half and with silvery-gray scales on its hind half. In male, seventh abdominal sternite with a bundle of bristly scales at mid-ventrum of caudal margin ; aedeagus swollen on its apical half, with a pair of long projections, between which there is a bundle of hair-like spines. In female, seventh abdominal sternite densely wrinkled. .....*C. vaticae* sp. nov.
- Fore wing without such a dark fascia beyond silvery-white costal spot. In male, seventh abdominal sternite simple in structure, without bristly scales ; aedeagus slender, tubular, without such hair-like spines. In female, seventh abdominal sternite normal in structure, without such wrinkles. 4
4. In male, ventral margin of valva smoothly curved without any incision or concave between cucullus and sacculus ; vesica of aedeagus with only minute needle-shaped cornuti. In female, ductus bursae longer than twice length of seventh abdominal sternite. 5
- In male, ventral margin of valva with a more or less wide incision or concave between cucullus and sacculus ; vesica of aedeagus with a large plate-like cornutus in addition to minute needle-shaped ones. In female, ductus bursae shorter than twice length of seventh abdominal sternite. 6
5. In male, costa of valva with a semicircular basal protuberance ; tegumen covered by spinules on ventral surface ; aedeagus with eight to nine rows of spinules near apex. In female, signum moderate in size, lined with about 20 thorn-like spines. .....*C. castanopsidis* Kumata et Kuroko
- In male, costa of valva weakly sinuate, without such a basal protuberance ; tegumen bare, without spinules on ventral surface ; aedeagus simply tubular, without spinules. In female, signum rather small, lined with about seven triangular spines. .....*C. leprosulae* sp. nov.
6. Fore wing with a blackish premedian costal spot very short and extending from basal 1/5 to 1/4. In male, valva with usual slender setae on inner surface ; aedeagus simply tubular, without a Y-shaped projection. 7
- Fore wing with a blackish premedian costal blotch much longer and extending from basal 1/7 to 2/5 or from 1/9 to 1/3. In male, valva with more or less swollen setae on inner surface in addition to slender marginal ones ; aedeagus with a Y-shaped projection stretched from middle. 8
7. In male, valva slightly tapering apically, with a narrow concave between cucullus and sacculus ; saccus short, about 1/2 as long as lateral arms of vinculum ; vesica of aedeagus with a large, spatulate cornutus in addition to minute needle-shaped ones. In female, sclerotized antrum short, about 1/4 as long as seventh abdominal sternite ; ductus bursae with a large accessory protuberance at base. .....*C. neobalanocarpi* sp. nov.
- In male, valva nearly parallel-sided, with a wide concave between cucullus and sacculus ; saccus long, about as long as lateral arms of vinculum ; vesica of aedeagus with a comma-shaped cornutus in addition to minute needle-shaped ones. In female, sclerotized antrum longer, nearly as long as seventh abdominal sternite ; ductus bursae simply tubular. .....*C. hopeella* sp. nov.
8. In male, valva covered by slightly swollen and truncate setae on inner surface rather sparsely ; tegumen covered by hook-shaped spinules on ventral surface. In female, ductus bursae about as long as or a little longer than seventh abdominal sternite ; signum lined with long and thick spines. .....*C. lithocarpiella* sp. nov.
- In male, valva covered by globose or scaly setae on inner surface very densely ; tegumen bare on ventral surface, without such spinules. In female, ductus bursae longer, about 1.5 times as long as seventh sternite ; signum lined with shorter and slenderer spines.

.....*squamosa* sp. nov.

9. Fore wing with a silvery-white, triangular fascia placed at basal 1/5, and followed by a very wide, reversedly trapeziform, dark fascia, which extends from basal 1/5 to middle and is suffused with blackish scales on its costal half and with silvery-gray ones on its hind half. In male, valva with a wide, deep, round concave between cucullus and sacculus. In female, ostium bursae surrounded by a large genital plate. .....*C. shoreae* sp. nov.
- Fore wing with a blackish spot or blotch placed on costa around basal 1/5 and preceded by a narrow, silvery-white mark, which expands towards hind margin of wing and then widens outward along hind margin to occupy the hind space below the blackish costal spot or blotch. In male, valva without a deep concave between cucullus and sacculus, or at most with a small notch. In female, ostium bursae without any genital plate. 10

10. In male, seventh abdominal sternite with a bundle of long bristly scales at mid-ventrum of caudal margin; aedeagus swollen on its apical half, with a pair of long, slender projections, between which there is a bundle of hair-like spines. In female, seventh abdominal sternite with dense wrinkles; sclerotized antrum very short, about 1/10 as long as seventh abdominal sternite; corpus bursae not well swollen; signum lined with elongate spines which are arranged in a V-shape. .....*C. azmii* sp. nov.
- In male, seventh abdominal sternite normal in structure, without any bristly scales; aedeagus simply tubular, without such projections and spines. In female, seventh abdominal sternite as usual, without any wrinkles; sclerotized antrum longer than seventh abdominal sternite; corpus bursae well swollen; signum small, irregular in form, lined with a few minute, triangular spines. .....*C. argentata* sp. nov.

11. Fore wing with an elongate, blackish costal blotch placed before middle; apical extremity of fore wing occupied by an oval blackish spot, which is preceded by a whitish spot on costal side. In male, valva smoothly tapering towards narrowly produced cucullus. In female, ductus bursae longer than thrice length of seventh abdominal sternite. 12
- Fore wing with an elongate, orange-brownish costal blotch placed before middle, apical extremity of wing occupied by a silvery-gray, minute mark, which is preceded by a blackish spot or blotch. In male, valva with a deep incision or concave between cucullus and sacculus, and with an elongate comb along apical and ventral margins of produced apex of sacculus. In female, ductus bursae at most as long as seventh abdominal sternite. 13

12. Fore wing with a blackish fascia at middle in addition to other markings. In male, valva with a large comb on inner surface near costa, and with three large scales on outer surface besides long androconial scales; saccus elongate-triangular, acuminate apically; aedeagus with a moderately long projection stretched from middle. In female, ductus bursae with its caudal 1/3 well sclerotized. .....*C. pectinata* sp. nov.
- Fore wing with a silvery-white spot at middle in disc in addition to other markings. In male, valva with no large comb on inner surface nor large scales on outer surface; saccus short, pentagonal; aedeagus serrulate along oblique apical edges, without a long projection. In female, ductus bursae with its caudal 1/5 membraneous, the second caudal 1/5 densely lined with comb-like spinules, the third 1/5 longitudinally striated, the fourth 1/5 membraneous, and the last 1/5 lined with thorn-like spinules. .....*C. melastigmata* sp. nov.

13. Fore wing with a blackish spot following orange-brownish premedian costal blotch, and with a silvery-gray pretornal spot margined with two minute black spots on its upper edge. In male, valva with cucullus having a small protuberance on ventral margin near base, produced apex of sacculus widely round, and costa arched; aedeagus with a narrow, dentated, tongue-shaped projection stretched from middle. In female, ductus bursae striated on its caudal 2/3; signum lined with small, needle-shaped spines. ....*C. malayana* sp. nov.
- Fore wing with the orange-brownish premedian costal blotch and a golden-grayish pretornal spot both surrounded by dark brownish scales. In male, valva with cucullus bent at middle and lacking such a protuberance, produced apex of sacculus rather narrowly round, and costa very weakly arched; aedeagus simply tubular, without such a projection. In female, ductus bursae striated on its cephalic half; signum lined with large, lanceolate sclerites which are serrulate along the margin. .....*C. thapai* sp. nov.

Descriptions of new species

Chrysocercops argentata sp. nov.
[Figs. 1, 2, 3, 23(A), 26(A), 29(A)]

Measurement. ♂♀. Expanse of wings: 6.1-6.8 mm (6.1 mm in holotype) in Nepalese material and 4.8-5.6 mm in Malaysian material. Length of fore wing: 2.8-3.4 mm (3.0 mm in holotype) in Napalese material and 2.3-2.7 mm in Malaysian material.

Description. ♂♀. Face and vertex silvery-gray with a metallic lustre strongly, the former a little lighter. Palpi whitish internally, ochre-whitish laterally. Antenna about 1.3 times as long as fore wing, dark fuscous, with scape and pedicel ochreous. Thorax ochre-brownish dorsally and silvery-whitish ventrally; tegulae silvery-gray mesally and narrowly ochre-brownish laterally. Legs ochre-whitish with a metallic lustre on whole surface except for whitish basal half of hind femur;

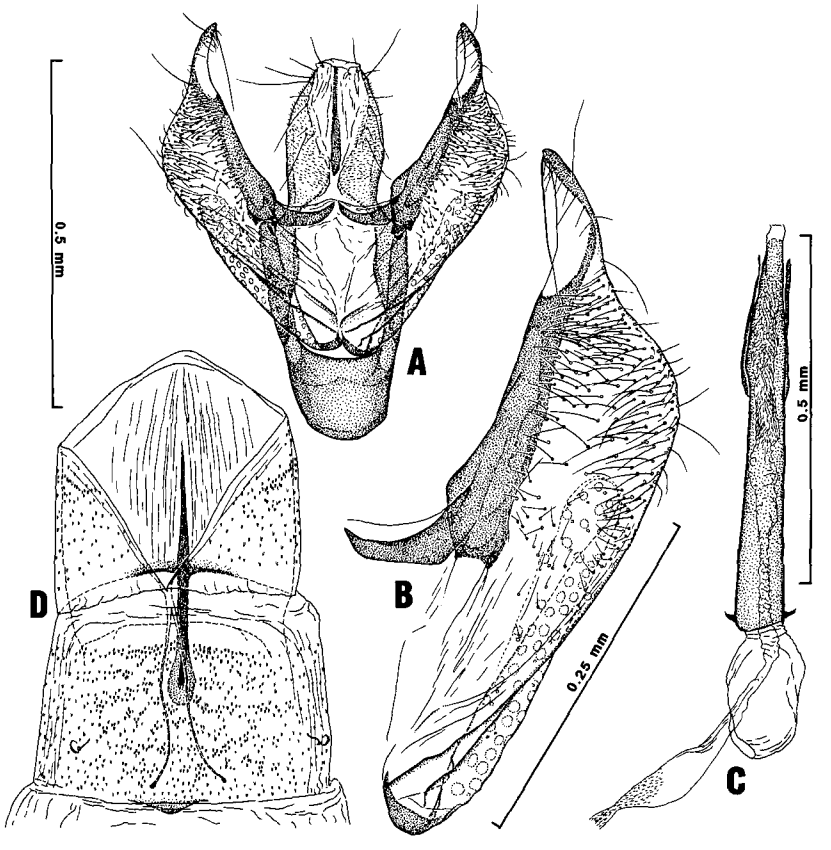


Fig. 1. *Chrysocercops argentata* sp. nov. A: Male genitalia in caudal view, aedeagus omitted [Grc-5663, holotype] — B: Right valva enlarged [ditto] — C: Aedeagus [ditto] — D: Male seventh and eighth abdominal segments in ventral view [Grc-5628, Pathraia, Terai Forest, Napal, em. 21/x/1983, ex *Shorea robusta* (Npl-473)].

tarsi without any distinct bands or rings. Abdomen ochre-grayish dorsally, ochre-whitish ventrally, without ventral bands.

Fore wing (Fig. 29 : A) ochre- to reddish-brownish with a metallic lustre in ground colour ; a small blackish spot placed on costa at about basal 1/6 of wing, rectangular or round, basally accompanied by a silvery-white mark, this expanding to hind margin of wing, then broadened outward to occupy hind area below the blackish spot, and tinged with leaden gray in some light ; a silvery-gray streak extending along wing-fold from basal 1/4 to 2/5, nearly oblong, detached from hind margin of wing ; two longitudinal streaks extending from middle to apex of wing, silvery-gray with a strong metallic lustre, sometimes tinged with purple in some light, one in disk near costa and the other along hind margin of wing, these streaks being confluent with each other towards apex of wing ; cilia gray, tinged with brown towards wing-margins, without any fringe-line. Hind wing and its cilia gray to dark gray.

Male genitalia (Figs. 1 ; 2). Tegumen short, spatulate in ventral view, covered

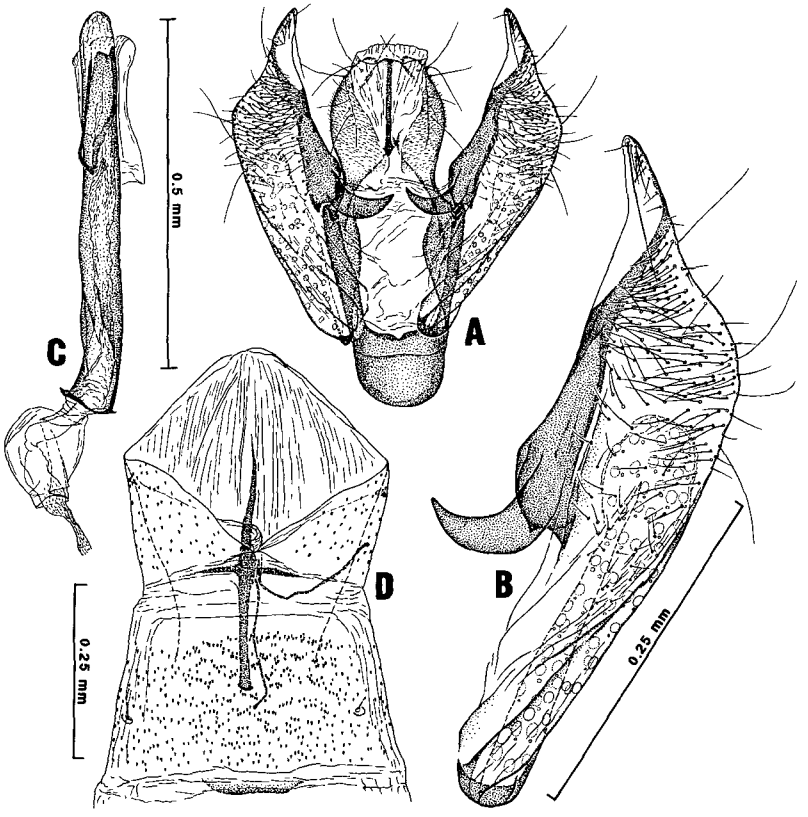


Fig. 2. *Chrysocercops argentata* sp. nov. A : Male genitalia in caudal view, aedeagus omitted [Grc-5614, Mencali F. R., Rompin, Pahang, Malaysia, em. 1/ix/1990, ex *Hopea nutans* (3865)] — B : Right valva enlarged [ditto] — C : Aedeagus [ditto] — D : Male seventh and eighth abdominal segments in ventral view [Grc-5644, Mencali F. R., em. 3/ix/1990, ex *Hopea nutans* (3865)].

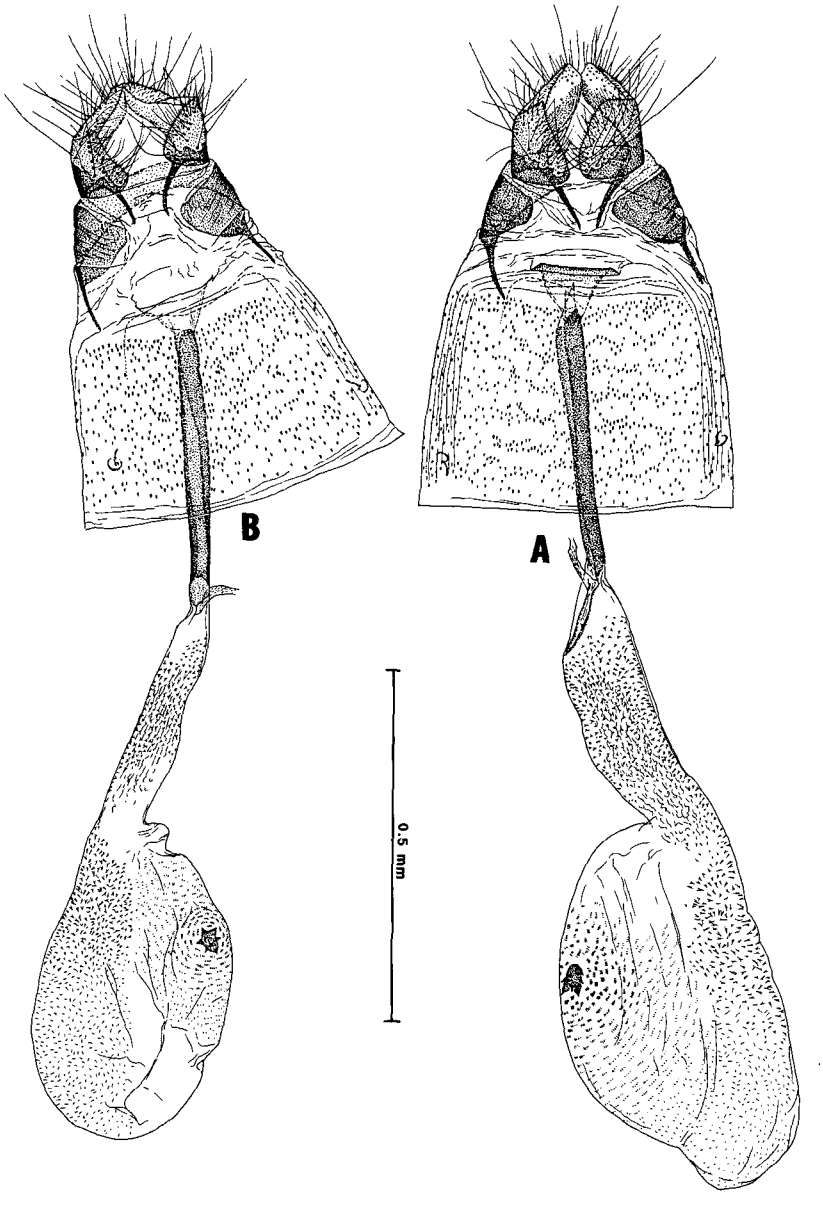


Fig. 3. *Chrysocercops argentata* sp. nov. A : Female genitalia in ventral view [Grc-5664, Pathraia, Terai Forest, Nepal, em. 21/ix/1983, ex *Shorea robusta* (Npl-473)] — B : Ditto [Grc-5615, Mencali F. R., Rompin, Pahang, Malaysia, em. 3/ix/1990, ex *Hopea nutans* (3865)].

by spinules laterally, with eight to ten setae along ventral margin of each lateral sclerite; tuba analis with a slender subscaphium. Vinculum U-shaped in ventral view, with lateral arms moderate in length, slightly widened cephalad; saccus short, widely round apically. Valva about twice as long as tegumen, moderate in width, with cucullus shortly protruded, tapering apically and bearing a long apical seta and some short ones along twisted ventral margin; costa weakly sclerotized, slightly lobated near base; sacculus widely round apically and basally, with moderately long setae scattered on inner surface around apical area and long androconial scales also on outer surface towards base. Aedeagus slender, tubular, slightly longer than valva, with a pair of minute projections at base; vesica with short needle-shaped cornuti gathered near middle of aedeagus; ductus ejaculatorius short, globose. (Four preparations examined.)

Female genitalia (Fig. 3). Ostium bursae moderate in opening size, tapering cephalad, joined with a weakly sclerotized and long antrum, which is cylindrical, straight and longer than seventh abdominal sternite. Ductus bursae beyond antrum is much thicker than and about as long as antrum, and lined with dense spinules on almost whole area. Corpus bursae ellipsoidal in form, with one side much swollen; acute spinules occurring on one side opposite to swollen part, and comb-shaped spinules on swollen part around signum, which is small and lined with a few triangular, short spines. (Four preparations examined.)

Specimens examined. 6♂♂ & 4♀♀. Holotype: ♂, Pathraia (alt. 300 m), Terai Forest, Narayani, Nepal, em. 21/ix/1983, ex *Shorea robusta* (Npl-473), Gen. sl. no. Grc-5663, deposited in EIHU. Paratypes: 2♂♂ & 2♀♀, with same data as in holotype; 3♂♂ & 2♀♀, Mencali F. R., Rompin, Pahang, Malaysia, em. 1-4/ix/1990, ex *Hopea nutans* (3865); 1♂ & 1♀ in EDAK, 2♂♂ & 1♀ in FRIM, and 2♂♂ & 2♀♀ in EIHU.

Distribution. Nepal and Malaysia (Malay Peninsula).

Food plants. *Shorea robusta* Gaertn. (Dipterocarpaceae) in Nepal and *Hopea nutans* Ridl. (Dipterocarpaceae) in Malaysia.

Diagnosis. This new species is distinguished at once from *C. castanopsidis* Kumata et Kuroko* and *C. leprosulae* (sp. nov.) by the absence of a white mark on the costa at about basal 1/3 of the fore wing, by the more shortly protruded cucullus of the male ganitalia, and by the longer antrum of the female genitalia.

Notes. Two series of material collected from Nepal and Malaysia are significantly different in wing size and associated with different plant genera: in the Nepalese material the mean length of the fore wing is 3.06 mm (N=5) and the food plant belongs to the genus *Shorea*, while in the Malaysian material the mean length of the fore wing is much shorter, 2.52 mm (N=5), and the adult emerged from larvae feeding on *Hopea*. Nevertheless, I am inclined to conclude that both the series belong to the same species, because there are no obvious differences between them

* *C. castanopsidis* was originally based on material collected from southern Honsyû and Sikoku, Japan. On this occasion Okinawa I., Isigaki I. and Iriomote I. are added to its distributional range based on the following material: —

1♂, Yonaha-dake, Kunigami-son, Okinawa I., em. 4/xii/1990, ex *Castanopsis sieboldii* (3692), T. Kumata leg.; 3♂♂ & 3♀♀, Banna-dake, Isigaki I., em. 16-20/xi/1990, ex *C. sieboldii* (3648), T. Kumata leg.; 5♂♂ & 2♀♀, Uehara, Iriomote I., em. 12-15/xi/1990, ex *C. sieboldii* (3601), T. Kumata leg.

in colour pattern and genital structure (see Figs. 1-3). It is possible that the difference in wing size is due to breeding conditions.

The leaf mine (Fig. 29 : A) of *C. argentata* on *Shorea robusta* is an interparenchymal blotch occurring near leaf margins. It is rather large and somewhat swollen. In mature condition the upper surface of the mine is loosened or contracted, and is discoloured into dark brown in a sharp contrast to normal greenish parts of the leaf.

Chrysocercops leprosulae sp. nov.
[Figs. 4, 5, 23(B), 29(B)]

Measurement. ♂♀. Expanse of wings : 4.9-6.0 mm (5.4 mm in holotype, 5.56 mm on average of six specimens). Length of fore wing : 2.4-2.9 mm (2.7 mm in holotype, 2.67 mm on average of seven specimens).

Description. ♂♀. Face and vertex silvery-gray with a strong metallic lustre, the former being slightly tinged with ochre anteriorly. Palpi ochre-whitish internally, ochre-browinsh laterally, without any dark ring or band. Antenna about 1.3 times as long as fore wing, dark fuscous except for scape which is whitish below and ochreous above. Thorax brilliantly ochre-brownish, dorsally a little darker, with a silvery-whitish mark on each pleural surface ; tegula silvery-gray, with a nearly blackish appearance under some light. Legs ochre-whitish ; hind femur tinged with gray laterally ; all tarsi pale grayish, with apex of each segment narrowly whitish to form a paler apical ring. Abdomen grayish dorsally, ochre-whitish ventrally, with a broad grayish ventral band in middle and a white blotch on ventrum just caudad of this band.

Fore wing (Fig. 29 : B) brilliantly reddish-brownish on basal half and ochre-brownish on apical half in ground colour ; a small blackish spot placed on costa at basal 1/6, rectangular, basaly accompanied by a short whitish mark, this expands towards hind margin of wing, and then extends outward to occupy the hind space between the blackish spot and wing-margin, where it is tinged with silvery-gray ; a white spot placed on costa at basal 1/4 of wing, much smaller than the preceding blackish spot, narrowly margined with black ; a brilliantly silvery-gray streak extending along wing-fold from basal 1/4 to middle, elongate-oblong, slightly detached from hind margin of wing, tending to become blackish under some light ; two narrow silvery-gray streaks extending from middle to apex of wing, one placed in disc near costa and the other along hind margin ; these streaks being confluent with each other at their apical half, and the confluent part occupying almost whole apical 1/4 of wing and sometimes tinged with blackish purple under some light ; cilia grayish, tinged with brown towards wing-margins, without any fringe-line. Hind wing and its cilia dark gray.

Male genitalia (Figs. 4 ; 5 : A). Tegumen elongately spatulate in ventral view, weakly sclerotized laterally, not covered by spinules, with six to eight slender setae along ventral margin of each lateral sclerite ; tuba analis with a slender subscaphium acute apically. Vinculum U-shaped in ventral view, with lateral arms rather long and narrow ; saccus short, widely round apically. Valva a little longer than twice length of tegumen, rather slender ; cucullus narrowly produced beyond apex of sacculus, tapering apically, with three slender setae along twisted ventral margin ;

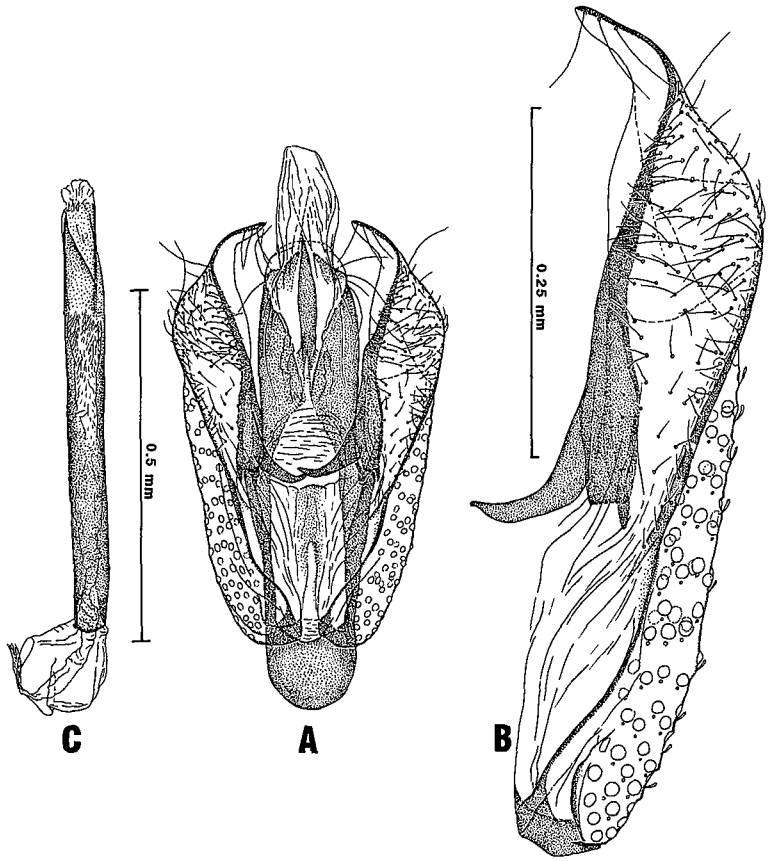


Fig. 4. *Chrysocercops leprosulae* sp. nov. A : Male genitalia in caudal view, aedeagus omitted [Grc-5646, Tasik Cini, Pekan, Pahang, Malaysia, em. 26/viii/1990, ex *Shorea leprosula* (3828)] — B : Right valva enlarged [ditto] — C : Aedeagus [ditto].

costa weakly sclerotized, slightly sinuate, without any protuberance or convex ; sacculus round basally and apically, with its ventral margin smooth without any incision between it and cucullus ; slender setae sparsely scattered in disc near apex ; long androconial scales occurring on outer surface of sacculus basally. Aedeagus about as long as valva, tubular, straight, with a pair of minute projection at base ; vesica with fine, needle-shaped cornuti forming a boundle ; ductus ejaculatorius short and globose. (Two preparations examined.)

Female genitalia (Fig. 5 : B). Ostium bursae moderate in opening size, tapering cephalad ; antrum weakly sclerotized, cylindrical, about 1/3 as long as seventh abdominal segment. Ductus bursae beyond antrum is about twice as long as seventh sternite and twice as thick as antrum, sparsely lined with spinules on its cephalic 3/4. Corpus bursae large ellipsoidal, with one side much swollen ; comb-shaped spinules scattered around signum, which is situated on swollen part, small, but larger than that of *C. argentata,* and lined with about seven short, triangular spines. (Two preparations examined.)

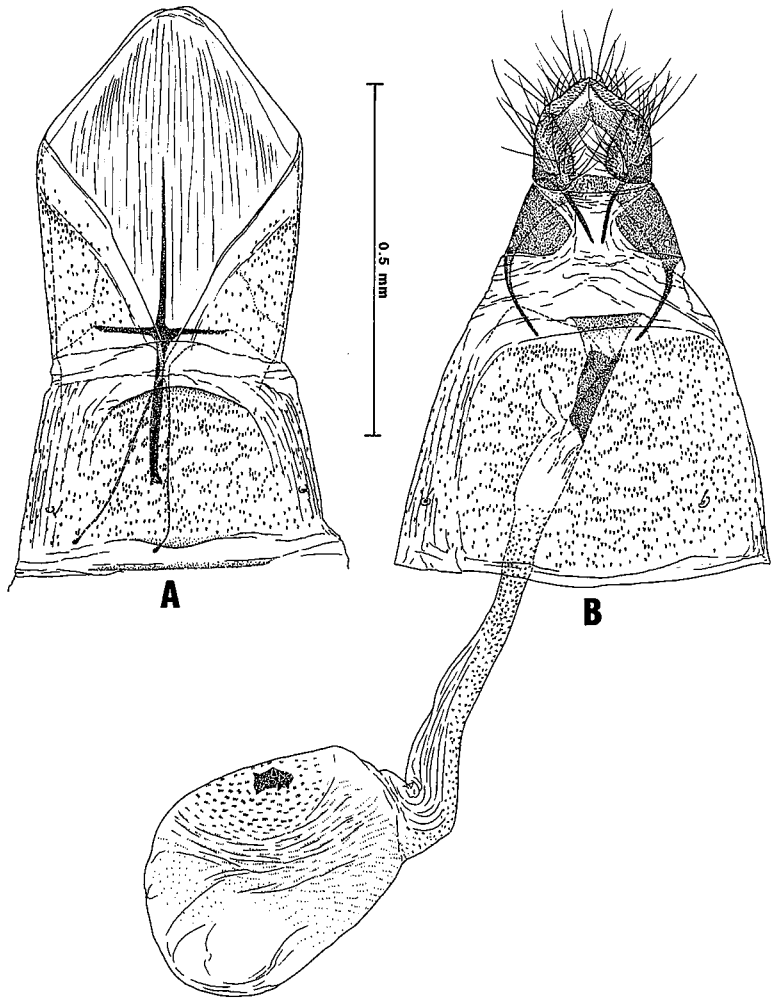


Fig. 5. *Chrysocercops leprosulae* sp. nov. A: Male seventh and eighth abdominal segments in ventral view [Grc-5618, holotype] — B: Female genitalia in ventral view [Grc-5647, Tasik Cini, Pekan, Pahang, Malaysia, em. 27/viii/1990, ex *Shorea leprosula* (3828)].

Specimens examined. 4♂♂ & 3♀♀. Holotype: ♂, Tasik Cini, Pekan, Pahang, Malaysia, em. 27/viii/1990, ex *Shorea leprosula* (3828), Gen. sl. no. Grc-5618, deposited in FRIM. Paratypes: 3♂♂ & 3♀♀, with same data as in holotype except for dates emerged, 26-29/viii/1990, 1♂ & 2♀♀ in FRIM and 2♂♂ & 1♀ in EIHU.

Distribution. Malaysia (Malay Peninsula).

Food plant. *Shorea leprosula* Miq. (Dipterocarpaceae).

Diagnosis. In colour-pattern this new species is most similar to *C. castanopsidis* Kumata et Kuroko described from Japan among the known species of the genus, and is distinguished from *C. castanopsidis* only by the smaller blackish subbasal spot on

costa of fore wing. In *C. castanopsidis* the spot extends from the basal 1/8 to 1/4 of the fore wing (Fig. 29 : C). In genital structure, however, the new species is more clearly separated from *C. castanopsidis* by the male valva with a wider cucullus and without a subbasal protuberance on the costa, by the male tegumen without any spinules on the ventral surface, by the longer female antrum and by the simply ellipsoidal corpus bursae with a small signum which is lined with a few (about seven) triangular spines. In *C. castanopsidis*, the valva has a wholly slender cucullus and a round subbasal protuberance on the costa, the tegumen is covered by curved spinules on the ventral surface basally, the sclerotized antrum is much shorter, less than 1/8 length of the seventh abdominal segment, the corpus bursae is upturned near base, and the signum is lined with about 20 spines (Fig. 28).

From the preceding *C. argentata, C. leprosulae* can more easily be distinguished by the presence of a premedian whitish spot on the costa of the fore wing.

Notes. *C. leprosulae* is described on the basis of only one breeding series of adult specimens, which emerged from larvae mining in leaves of *Shorea leprosula* collected near Lake Cini. The larval leaf-mine is a large, interparenchymal blotch occurring along the leaf-margin as in the preceding species, *C. argentata.*

Chrysocercops vaticae sp. nov.
[Figs. 6, 7(A-B), 23(C), 29(D)]

Measurement. ♂♀. Expanse of wings : 5.7-6.5 mm (5.7 mm in holotype, 6.16 mm on average of 18 specimens). Length of fore wing : 2.7-3.2 mm (2.7 mm in holotype, 2.93 mm on average of 18 specimens).

Description. ♂♀. Face silvery-whitish, vertex silvery-grayish, both tinged with a metallic lustre strongly. Maxillary palpus whitish ; labial palpus whitish internally and ochre-whitish laterally. Antenna dark fuscous, slightly paler towards apex ; scape flattened, silvery-whitish below and ochreous above. Thorax silvery-gray with a metallic lustre on dorsum including tegulae, and ochre-brownish on ventrum below wings. Fore and mid legs ochreous-whitish, slightly tinged with gray towards apex of each segment. Hind leg silvery-whitish internally, ochre-brownish laterally, with coxa and basal half of femur silvery-white ; tibia darkened apically and basally ; each segment of tarsus slightly darkened medianly to form an indistinct, dark median band. Abdomen dark gray dorsally and silvery-whitish ventrally, with a broad, ochre-grayish band which occupies almost whole fourth and fifth segments ; anal extremity (apex of seventh segment) dark fuscous in both sexes.

Fore wing (Fig. 29 : D) ochre- or orange-brownish with a metallic lustre in ground colour, slightly darkened at basal extremity ; a minute blackish costal spot placed near base ; a blackish blotch extending on costa from basal 1/7 to 1/4, expanding below towards wing-fold, nearly rectangular ; a space between these blackish spot and blotch being shortly silvery-whitish, this silvery-whitish mark expanding below towards hind margin of wing and then extending outward up to apex of the blackish blotch to occupy the whole hind space below the blotch, tinged with a leaden metallic lustre under some light ; a small silvery-whitish spot on costa at basal 1/3, rather elongate, margined with black apically and basally ; a rather broad, oblique dark fascia situated at middle of wing, suffused with blackish scales

on costal side and with silvery-gray scales on hind side, nearly as wide as the subbasal blackish blotch ; two silvery-gray streaks extending from basal 3/5 to apex of wing, one situated in disc near costa and the other along hind margin of wing, these streaks being confluent towards apex of wing, tinged very strongly with a metallic lustre basally and blackish purple apically ; cilia dark gray, tinged with brown towards wing margins, without any fringe line. Hind wing and its cilia dark gray.

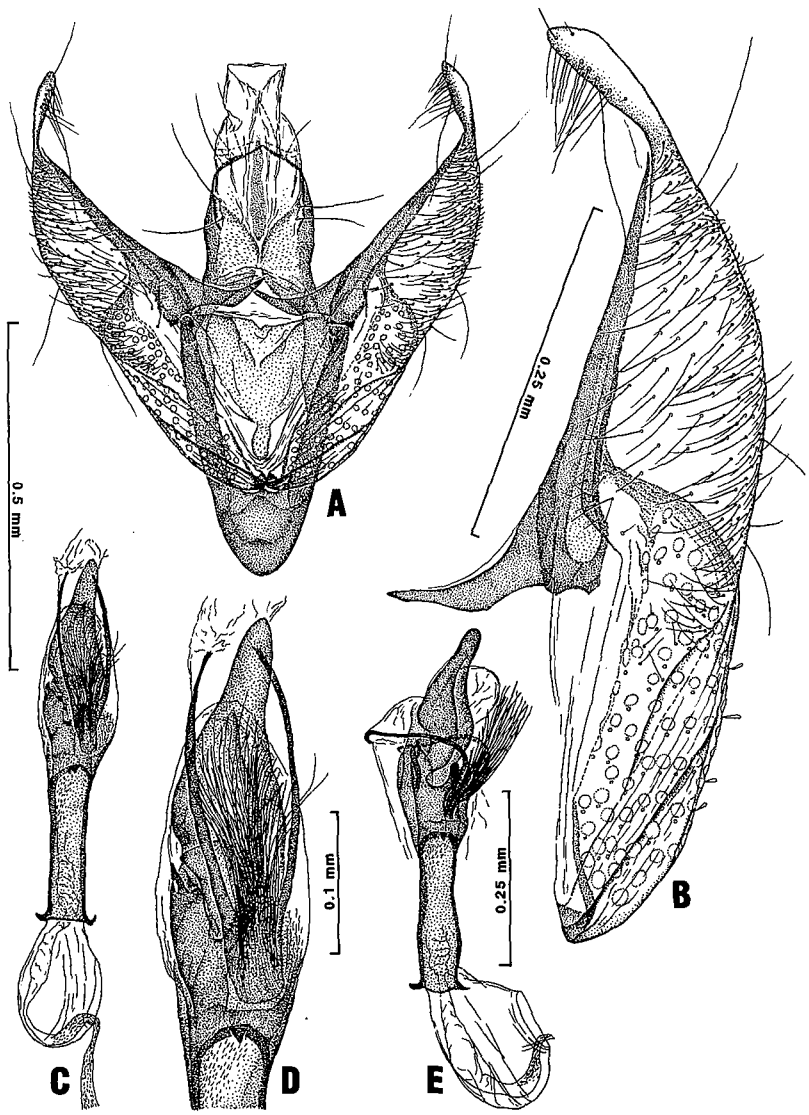


Fig. 6. *Chrysocercops vaticae* sp. nov. A : Male genitalia in caudal view, aedeagus omitted [Grc-5638, holotype] — B : Right valva enlarged [ditto] — C : Aedeagus [ditto] — D : Apical part of aedeagus enlarged [ditto] — E : Aedeagus [Grc-5606, Pasoh F. R., Negeri Sembilan, em. 10/x/1986, ex *Vatica bella* (2843)].

Male genitalia (Figs. 6 ; 7 : A). Tegumen shortly spatulate in ventral view, weakly sclerotized laterally, covered by dense spinules on ventral surface basally, with four to six slender setae along ventral margin of each lateral sclerite ; tuba analis with a weakly sclerotized, slender subscaphium. Vinculum nearly V-shaped in ventral view, with lateral arms slender and slightly dilated dorsally ; saccus short, narrowly round apically. Valva nearly three times as long as tegumen, moderate in width, tapering apically ; cucullus slender and slightly turned inward, with 15-20 slender setae of various length occurring along twisted ventral margin near apex ; costa weakly sclerotized, nearly straight ; sacculus with slender setae scattered on inner surface apically, and with long androconial scales on outer surface basally. Aedeagus about 3/4 as long as valva, well swollen beyond middle, and terminating in a tongue-shaped projection, which is widened basally and has a small, but prominent, finger-shaped projection at its base ; a pair of slender and long projections stretched from middle to apex of aedeagus, convergent basally, with a bundle of many slender and long hair-like spines between them ; a pair of minute projections at base of aedeagus ; vesica with minute, needle-shaped cornuti ; ductus ejaculatorius short and globose. Seventh abdominal sternite with a thick bundle of long, bristly scales stretched from mid-ventrum of caudal margin, where is slightly convex caudally. (Three preparations examined.)

Female genitalia (Fig. 7 : B). Papillae anales slightly lengthened, with apophyses posteriores long, nearly half as long as seventh abdominal segment ; apophyses anteriores rather long, a half as long as apophyses posteriores. Ostium bursae moderate in opening size, very slightly tapering cephalad ; antrum short ring-shaped, about 1/5 as long as seventh abdominal segment. Ductus bursae moderately long, longer than seventh abdominal segment, and densely lined with spinules on whole surface. Corpus bursae rather small, elongate-ellipsoidal, lined with comb-shaped spinules around signum, which is moderate in size, and bears many acute spines arranged in a V-shape. Seventh abdominal sternite distinctly wrinkled on whole surface, the wrinkles being somewhat convergent cephalad. (Three preparations examined.)

Specimens examined. 10♂♂ & 9♀♀. Holotype : ♂, Pasoh F. R., Negeri Sembilan, Malaysia, em. 10/x/1986, ex *Vatica bella* (2843), Gen. sl. no. Grc-5638, deposited in FRIM. Paratypes : 9♂♂ & 9♀♀, with the same data as in holotype, 4♂♂ & 4♀♀ in FRIM and 5♂♂ & 5♀♀ in EIHU.

Distribution. Malaysia (Malay Peninsula).

Food plant. *Vatica bella* V. Slooten (Dipterocarpaceae).

Diagnosis. The new species, *C. vaticae*, is distinguished from the preceding two species and *C. castanopsidis* by the median dark fascia of the fore wing, by the complicated structure of the male aedeagus, by the presence of a bundle of many bristly scales on the male seventh abdominal sternite, by the female signum with spines arranged in a V-shape, and by the wrinkled female seventh abdominal sternite. The genital characters mentioned above indicate that *C. vaticae* is closely related to the next species, *C. azmii* (sp. nov.), as discussed under the species-group of the genus. However, *C. vaticae* can be clearly separated from *C. azmii* by the presence of a premedian white costal spot and a median dark fascia on the fore wing, by the absence of a notch on the ventral margin of the male valva between cucullus and sacculus, by the presence of the finger-shaped small projection on the male

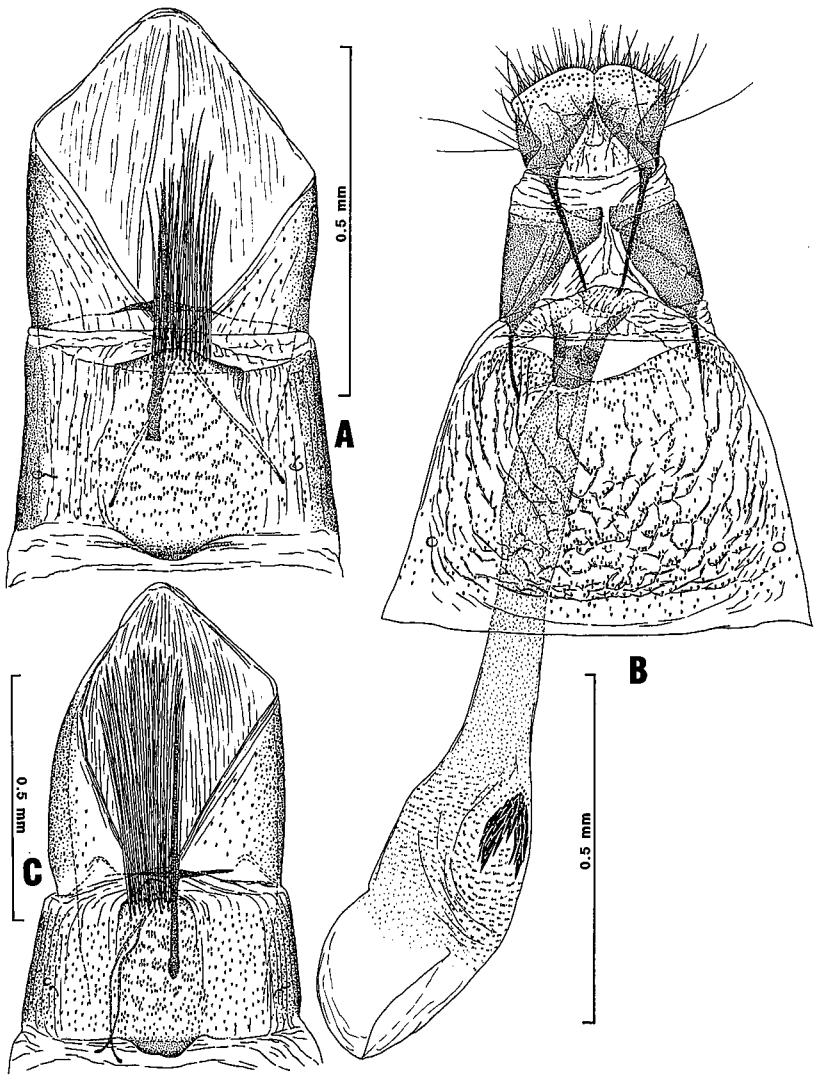


Fig. 7. A-B: *Chrysocercops vaticae* sp. nov. A: Male seventh and eighth abdominal segments in ventral view [holotype] — B: Female genitalia in ventral view [Grc-3725, Pasoh F. R., Negeri Sembilan, em. 10/x/1986, ex *Vatica bella* (2843)].
C: *Chrysocercops azmii* sp. nov., male seventh and eighth abdominal segments in ventral view [Grc-5616, FRIM, Kepong, Selangor, Malaysia, em. 11/x/1990, ex *Shorea maxonia* (4132)].

aedeagus, and by the longer apophyses anteriores of the female eighth abdominal segment.

Notes. *C. vaticae* is a leaf-miner on *Vatica bella*. The mine, at first a linear gallery occurring on the upper surface of leaves, broadens into a blotch along the margin of leaves. In mature condition, the blotchy part is contracted upward to make a narrow fold. The cocoon, made in a furrow on the wall of the plastic case,

is boat-shaped, ochre-whitish, and usually provided with four minute bubbles on the surface.

Chrysocercops azmii sp. nov.
[Figs. 7(C), 8, 9(A), 23(D), 25(A), 26(C), 29(E)]

Measurement. ♂♀. Expanse of wings: 5.9-7.6 mm (7.0 mm in holotype, 6.96 mm on average of 19 specimens). Length of fore wing: 2.9-3.7 mm (3.4 mm in holotype, 3.36 mm on average of 19 specimens).

Description. ♂♀. Face silvery-whitish; vertex silvery-gray, darkened posteriorly and laterally; both face and vertex tinged with a metallic lustre strongly. Palpi ochre-brownish, without any dark ring. Antenna about 1.4 times as long as fore wing, dark fuscous, somewhat becoming paler towards apex; scape flattened, whitish below and pale ochre-brownish above. Thorax reddish-brownish dorsally, pale ochre-brownish ventrally, with tegulae silvery-grayish and much darker than vertex. Fore and mid legs pale ochre-brownish, more or less darkened at apex of each segment to form a darker apical band. Hind leg ochre-brownish, with coxa and apical half of femur whitish; a blackish minute spot placed at apex of femur, very conspicuous in male; tibia broadly darkened at base and subapex; tarsus dark grayish except for ochreous apex of each segment. Abdomen brilliantly grayish dorsally and silvery-whitish ventrally, with a broad brownish band on fourth and fifth abdominal segments; anal extremity (apex of seventh segment) fuscous in both sexes; ventral bristly scales projected from seventh segment grayish.

Fore wing (Fig. 29: E) reddish-brown with a metallic lustre in ground colour, slightly lighter beyond basal 3/5; a small blackish spot placed near base of costa, nearly expanding towards wing-fold; a blackish premedian blotch extending along costa from basal 1/8 to 1/4, nearly semicircular or reversedly trapeziform, occupying 1/4 to 1/3 width of wing, but never reaching wing-fold; a short costal space between these blackish spot and blotch occupied by a silvery-white mark, which expands towards hind margin of wing, then widens outward beyond apex of the blackish premedian costal blotch and occupies the whole hind space below the blotch; costal margin between basal 1/4 to middle of wing being narrowly darkened, usually interrupted by ground colour at its basal 1/3; a silvery-gray blotch placed on hind margin just before middle of wing, a little longer than the blackish premedian costal blotch, nearly occupying a half width of wing, and tending to become blackish under some light; a narrow, silvery-gray streak running from middle to apex of wing in disc just below costal margin, expanding apically to occupy the whole apical space of wing, and tending to become blackish or purplish on its apical area; a similar streak running along termen, much shorter and slenderer than the discal one, always confluent with the latter apically; cilia along termen ochreous basally and grayish apically, and those along hind margin wholly grayish, without any fringe-line. Hind wing dark gray, with cilia grayish.

Male genitalia (Figs. 7: C; 8). Tegumen moderate in length, gradually tapering towards round apex in ventral view, narrowly sclerotized laterally, covered by spinules on ventral surface densely, with five to seven slender setae along ventral margin of each lateral sclerite; tuba analis with a slender subscaphium. Vinculum V-shaped in ventral view, with lateral arms slender; saccus short, narrowly round

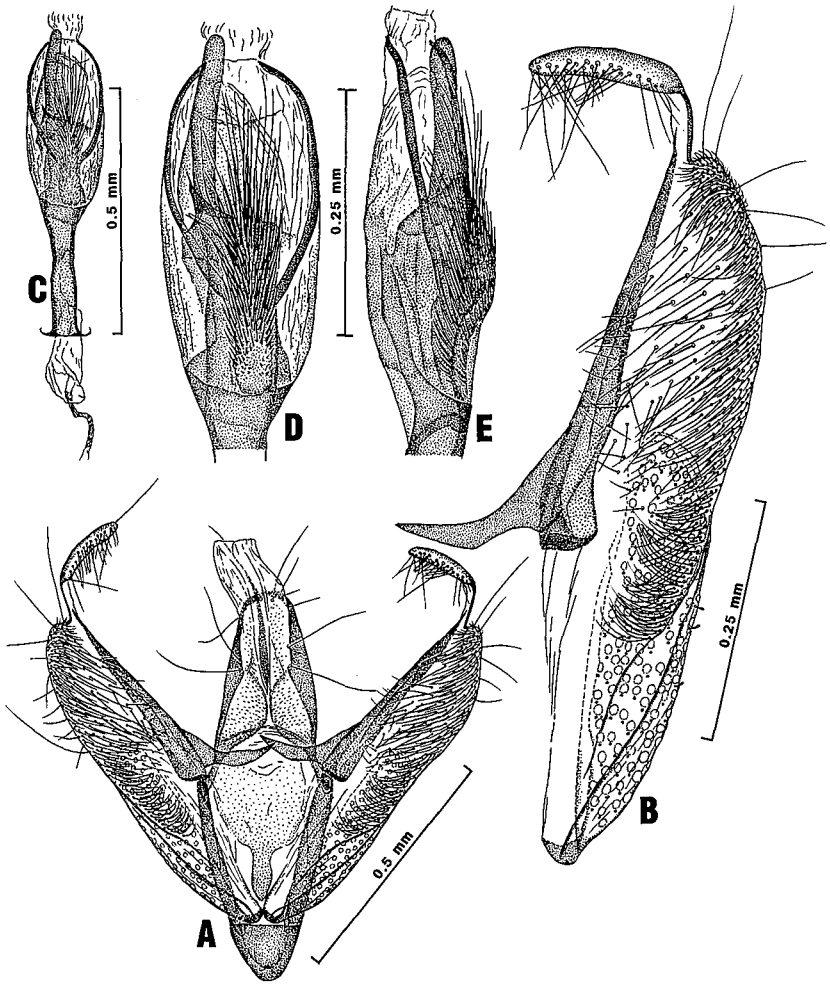


Fig. 8. *Chrysocercops azmii* sp. nov. A : Male genitalia in caudal view, aedeagus omitted [Grc-5634, holotype] — B : Right valva enlarged [ditto] — C : Aedeagus[ditto] — D : Apical part of aedeagus enlarged [ditto] — E : Ditto [Grc-5616, paratype].

apically. Valva a little longer than twice length of tegumen, slightly tapering apically ; costa weakly sclerotized, nearly straight ; cucullus well produced, more or less swollen apcially, with 20-30 slender setae on swollen area ; sacculus shortly produced apically, with a small notch between it and cucullus ; slender setae occurring on inner surface of sacculus rather densely and long androconial scales on the outer surface rather sparsely. Aedeagus about 7/10 as long as valva, well swollen on apical half as in *C. vaticae*, terminating in a slender tongue-shaped projection, which is dilated basally as in *C. vaticae*, but lacks any projection at its base ; a pair of long, slender projections stretched from apical 1/3 to apex of aedeagus, convergent apically and basally, with a bundle of many long, hair-like spines between them as in *C. vaticae* ; a pair of minute projections occurring at base of aedeagus ; vesica

with microscopic needle-shaped cornuti; ductus ejaculatorius short and globose. Seventh abdominal segment with a thick bundle of long bristles at mid-ventrum of caudal margin as in *C. vaticae*, but the caudal convex is smaller than that of *C. vaticae*. (Two preparations examined.)

Female genitalia (Fig. 9: A). Apophyses posteriores moderate in length; apophyses anteriores very short, nearly 1/5 as long as apophyses posteriores. Interspace between seventh and eighth sternites forming a deep pouch, of which the ventral wall is irregularly wrinkled; this pouch seems to be a receptor of the mid-ventral bristles of the male seventh sternite. Ostium bursae opening at caudal end of dorsal wall of the pouch, moderate in opening size, slightly tapering cephalad; antrum shortly sclerotized, ring-shaped, about 1/10 as long as seventh abdominal

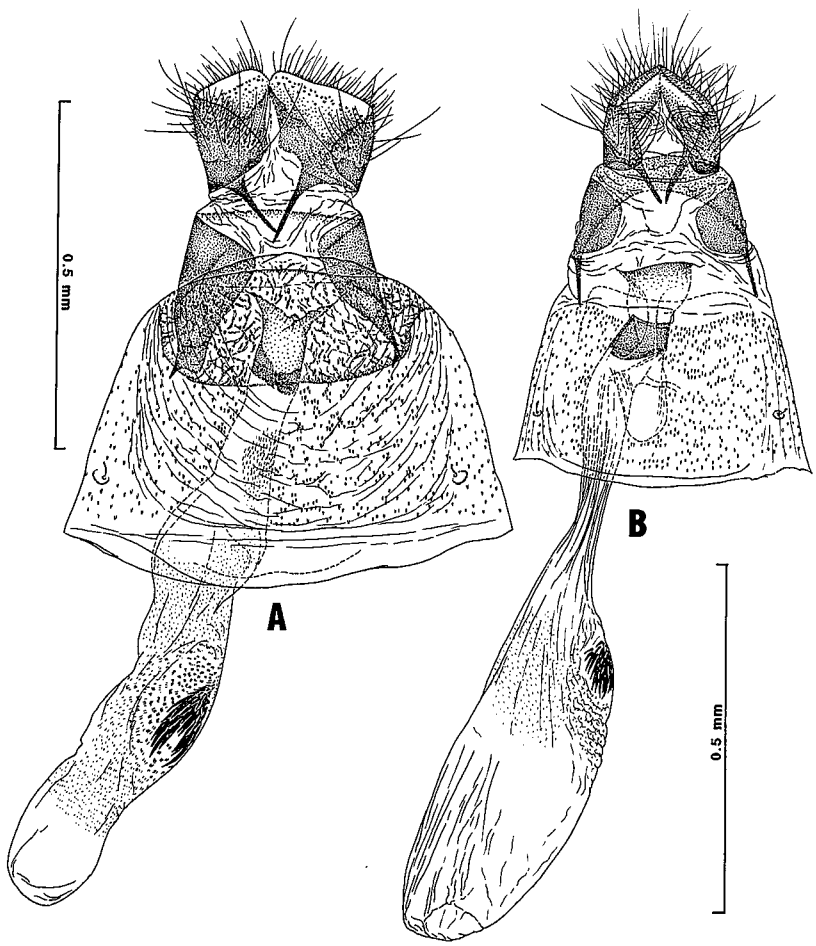


Fig. 9. A: *Chrysocercops azmii* sp. nov., female genitalia in ventral view [Grc-5635, FRIM, Kepong, Selangor, Malaysia, em. 11/x/1990, ex *Shorea maxonia* (4132)].
B: *Chrysocercops neobalanocarpi* sp. nov., female genitalia in ventral view [Grc-3730, Pasoh F. R., Negeri Sembilan, Malaysia, em. 10/x/1986, ex *Neobalanocarpus heimii* (2846)].

sternite. Ductus bursae a little shorter than seventh sternite, well swollen cephalad, in its central area with a small patch lined with spinules; corpus bursae slender-ellipsoidal, not well swollen, lined with fine, comb-shaped spinules around signum, which is lined with elongate spines in a V-shape. Seventh abdominal sternite irregularly wrinkled as in *C. vaticae*. (Two preparations examined.)

Specimens examined. 33♂♂ & 23♀♀. Holotype: ♂, FRIM, Kepong, Selangor, Malaysia, em. 11/x/1990, ex *Shorea maxonia* (4132), Gen. sl. no. Grc-5634, deposited in FRIM. Paratypes: 32♂♂ & 23♀♀, with same data as in holotype except for dates emerged, 9-15/x/1990, 15♂♂ & 12♀♀ in FRIM and 16♂♂ & 11 ♀♀ in EIHU.

Distribution. Malaysia (Malay Peninsula).

Food plant. *Shorea maxonia* (Dipterocarpaceae).

Diagnosis. *C. azmii* is very closely related to *C. vaticae* as discussed under the latter species. It is, however, distinguished at once from *C. vaticae* by the absence of a silvery-white costal mark at the basal 1/3 of the fore wing.

Notes. The leaf-mine of *C. azmii* was found on *Shorea maxonia* at Dipterocarp Arboretum in the campus of the Forest Research Institute of Malaysia. The mine is at first a linear gallery on the lower surface of leaf, usually extending from the mid-vein to the margin of leaf, then it is broadened into a blotch along the margin. Finally, the lower surface of the mine is contracted to make a narrow fold of the leaf (Fig. 26: C).

This species is named in honour of Mr. Azmi Mahyudin of the Forest Research Institute of Malaysia, Kuala Lumpur, Malaysia.

Chrysocercops neobalanocarpi sp. nov.
[Figs. 9(B), 10, 23(E), 26(B), 30(A)]

Measurement. ♂♀. Expanse of wings: 5.3-5.5 mm (5.5 mm in holotype). Length of fore wing: 2.5-2.7 mm (2.7 mm in holotype).

Description. ♂♀. Face and vertex silvery-grayish with a metallic lustre, but face a little lighter. Palpi silvery-whitish, with apical segment of labial palpus slightly darkened below. Antenna about 1.2 times as long as fore wing, dark fuscous except for flattened scape, which is whitish below and ochreous above. Thorax silvery-gray on dorsum including tegulae, and ochre-brownish on ventrum below wings. All legs ochre-whitish except for silvery-whitish hind coxa and basal half of hind femur, without distinct rings or bands.

Fore wing (Fig. 30: A) ochre-brownish with a metallic lustre in ground colour; a minute blackish spot placed on costa near base; a little larger blackish spot on costa at about basal 1/7 of wing, expanding below near wing-fold; a little wider, blackish spot also on costa at basal 1/4 of wing; an interspace between the second and third blackish spots occupied by a silvery-white mark, this mark expanding towards hind margin of wing, then widened along hind margin from base of the 2nd blackish spot to apex of the 3rd one to occupy hind space below these blackish marks, and tending to become metallic gray under some light; a whitish spot placed on costa at basal 2/5 or a little before middle, elongate along costa, margined with black scales sparsely; a moderately large silvery-gray blotch extending along wing-fold from basal 2/5 to 3/5 of wing, nearly touching hind margin of wing, and

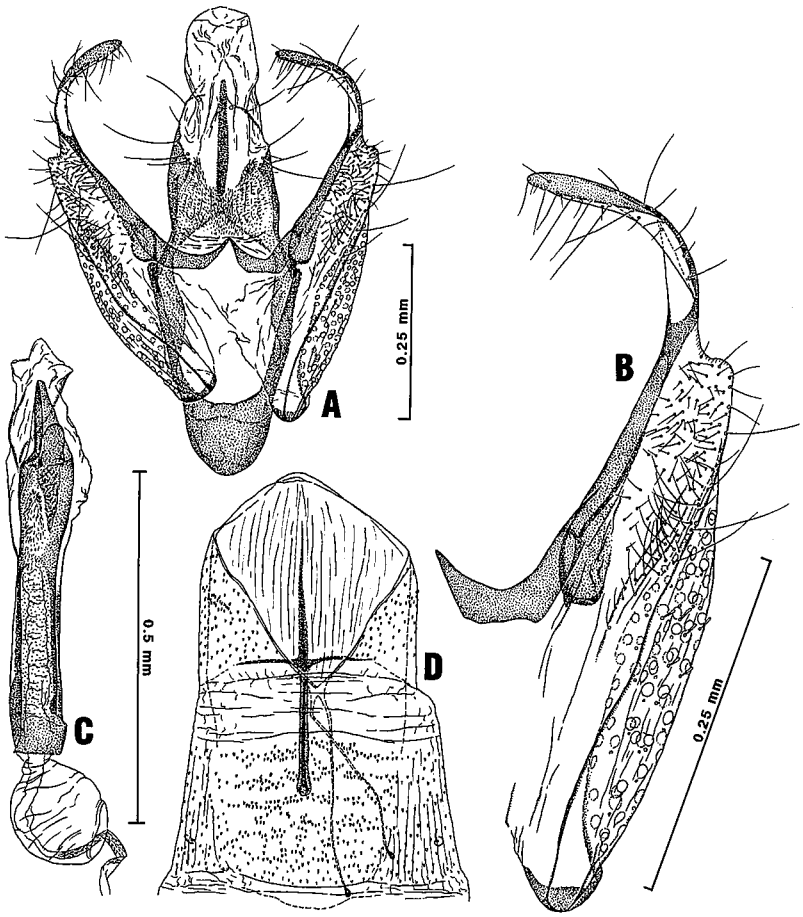


Fig. 10. *Chrysocercops neobalanocarpi* sp. nov. A: Male genitalia in caudal view, aedeagus omitted [Grc-3729, holotype] — B: Right valva enlarged [ditto] — C: Aedeagus [ditto] — D: Male seventh and eighth abdominal segments in ventral view [ditto].

usually tending to become dark fuscous under some light; two silvery-gray streaks extending from basal 3/5 to apex of wing, apically expanding and confluent with each other to occupy almost whole apical space of wing, one running in disc near costa, and the other along hind margin of wing and narrowly joined with the silvery-gray median blotch; cilia along termen ochreous-gray without any fringe line, and those along hind margin pale gray. Hind wing gray, with cilia pale gray.

Male genitalia (Fig. 10). Tegumen spatulate in ventral view, weakly sclerotized laterally, covered by dense spinules on ventral surface basally, the apical spinules being a little thicker, longer and hook-form; seven to eight slender setae occurring along ventral margin of each lateral sclerite apically; tuba analis with a narrow subscaphium. Vinclum V-shaped in ventral view, with lateral arms slender; saccus short, about 1/2 as long as the lateral arms, round apically. Valva about twice as long as tegumen, slightly tapering apically; cucullus well produced, long, slender,

slightly bent inward, with slender setae of various length occurring mostly along its twisted ventral margin ; costa weakly sclerotized, straight ; sacculus round basally, obtusely angulated apically, with ventral margin between it and cucullus shallowly concave ; slender setae scattered on inner surface of sacculus apically ; long androconial scales scattered on outer surface of sacculus basally. Aedeagus a little shorter than valva, tubular, with its apex tongue-shaped ; vesica with a large, spatulate cornutus near apex of aedeagus besides minute needle-shaped cornuti ; ductus ejaculatorius short, globose. Seventh abdominal segment normal in structure as in *C. argentata, C. leprosulae* and *C. castanopsidis*, without a tuft of bristly scales. (One preparation examined.)

Female genitalia (Fig. 9 : B). Apophyses anteriores and posteriores moderate and nearly equal in length. Ostium bursae moderate in opening size, short, very slightly tapering cephalad ; sclerous antrum about 1/4 as long as seventh abdominal segment, ring-shaped, and very slightly dilated cephalad. Ductus bursae moderate in length, about as long as seventh abdominal segment, wholly membraneous, with a large accessory protuberance at base. Corpus bursae elongate, ellipsoidal, longer than ductus bursae, partly lined with spinules around signum, which is rather small and lined with moderately long, acute spines. Seventh abdominal segment normal in structure, without any wrinkles. (One preparation examined.)

Specimens examined. 1♂ & 1♀. Holotype : ♂, Pasoh F. R., Negeri Sembilan, Malaysia, em. 10/x/1986, ex *Neobalanocarpus heimii* (2846), Gen. sl. no. Grc-3729, deposited in FRIM. Paratype : 1♀, with same data as in holotype, in EIHU.

Distribution. Malaysia (Malay Peninsula).

Food plant. *Neobalanocarpus heimii* King (Dipterocarpaceae).

Diagnosis. *C. neobalanocarpi* is rather similar to *C. argentata, C. leprosulae* and *C. castanopsidis* than to *C. vaticae* and *C. azmii* in simple structures of the aedeagus and the seventh abdominal sternite of both the sexes, but is distinguished from the first three by the angulated apex of the sacculus of the male valva, by the aedeagus with a large spatulate cornutus, by the female signum lined with acute long spines, by the female ductus bursae with a basal accessory protuberance and by the fore wing with a silvery-gray median blotch always joined with a silvery-gray terminal streak. It is more easily distinguished from *C. vaticae* and *C. azmii* by the absence of long hair-like spines of the male aedeagus and by the simple female seventh sternite without wrinkles.

On the other hand, *C. neobalanocarpi* seems to form a species-subgroup together with the following three species, *C. hopeella, C. lithocarpiella* and *C. squamosa*, as stated previously. *C. neobalanocarpi* is, however, separated from *C. hopeella* by the shorter saccus and the shorter antrum, and from *C. lithocarpiella* and *C. squamosa* by the slender setae of the valva (the valva is covered by dilated setae in *C. lithocarpiella*, and by large globose or scaly ones in *C. squamosa*).

Notes. This new species is a leaf-miner on *Neobalanocarpus heimii*. The mine, usually linear-blotchy, occurs on the upper surface of leaves. The blotchy part of the mine is blister-like as seen in most speceis belonging to *Acrocercops*-group, and is placed on a space between lateral veins unlike that of *Chrysocercops*. Pupation took place outside the mine, but no cocoon was preserved for study.

Chrysocercops hopeella sp. nov.
[Figs. 11, 12(B), 26(D), 30(B)]

Measurement. ♂♀. Expanse of wings: 4.5-5.1 mm (5.1 mm in holotype). Length of fore wing: 2.2-2.5 mm (2.5 mm in holotype).

Description. ♂♀. The colour pattern is very similar to that of the preceding species, *C. neobalanocarpi*, and there are no clear differences between them. But the following characters may serve to distinguish the present new species from *C. neobalanocarpi*.

Hind tibia with three fuscous spots laterally, one at its base, one at base of basal spur, and the rest at its apex. Second and third blackish subbasal spots of fore wing set closer to each other with a narrower silvery-whitish mark between them.

Male genitalia (Fig. 11). Tegumen shortly spatulate in ventral view, with ventral spinules aggregated into paired patches in central area and larger than those of *C. neobalanocarpi*. Saccus elongate-triangular in ventral view, about as long as lateral arms of vinculum. Valva nearly quadrate, parallel-sided, with sacculus angulated apically; cucullus narrowly produced, slightly incurved, a little swollen, with a few slender setae along its twisted ventral margin; costa narrowly sclerotized, scarcely convex near base; ventral margin between cucullus and sacculus very widely, but shallowly, concave; androconial scales on outer surface of sacculus scattered more sparsely than those of *C. neobalanocarpi*. Aedeagus a little longer

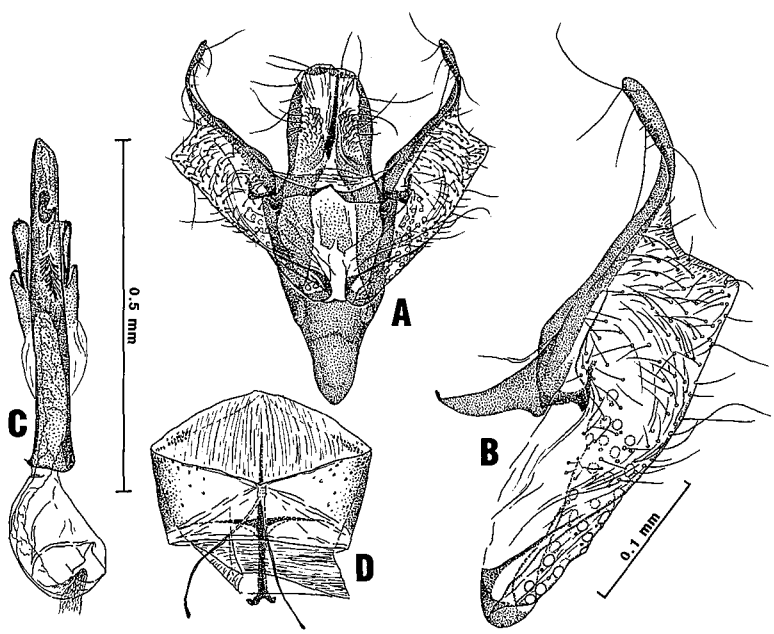


Fig. 11. *Chrysocercops hopeella* sp. nov. A: Male genitalia in caudal view, aedeagus omitted [Grc-5645, holotype] — B: Right valva enlarged [ditto] — C: Aedeagus [ditto] — D: Male seventh and eighth abdominal segments in ventral view [ditto].

than valva, tubular, straight, slightly tapering apically; vesica with a moderate, comma-shaped, plate-like cornutus and a group of minute needle-shaped ones. Anterior apodeme of eighth abdominal tergite shortly bifurcated apically. The other characters are as in *C. neobalanocarpi.* (One preparation examined.)

Female genitalia (Fig. 12: B). Ostium bursae large in opening size, nearly occupying whole ventral width, suddenly tapering cephalad; antrum well sclerotized, long-tubular, nearly as long as seventh abdominal segment. Ductus bursae slender, about as long as antrum, lined with spinules rather densely except for both caudal and cephalic extremities; corpus bursae long-eillipsoidal, longer than ductus

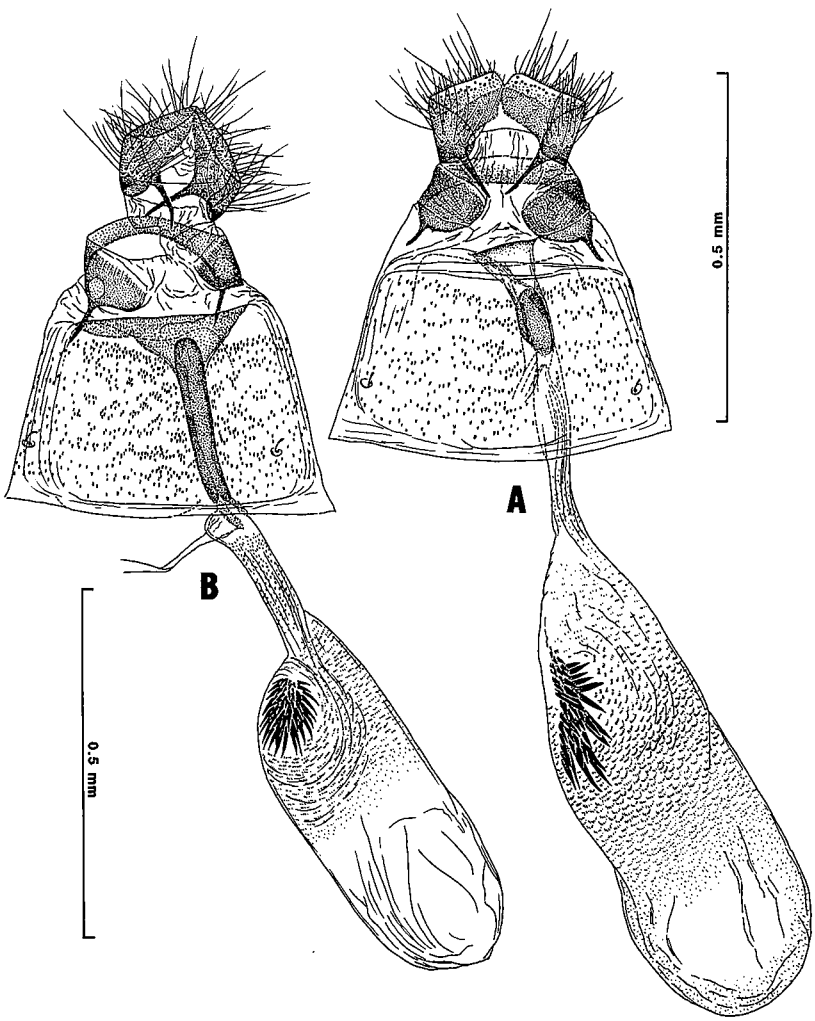


Fig. 12. A: *Chrysocercops lithocarpiella* sp. nov., female genitalia in ventral view [Grc-5649, Mencali F. R., Rompin, Pahang, Malaysia, em. 31/viii/1990, ex *Lithocarpus rassa* (3872)].
B: *Chrysocercops hopeella* sp. nov., female genitalia in ventral view [Grc-5613, FRIM, Kepong, Selangor, Malaysia, em. 22/viii/1990, ex *Hopea odorata* (3726)].

bursae, lined with dense comb-shaped spinules around signum, which is moderate in size and lined with many acute needle-shaped spines as in *C. neobalanocarpi*. (Two preparations examined.)

Specimens examined. 1♂ & 3♀♀. Holotype: ♂, Mencali F. R., Rompin, Pahang, Malaysia, em. 28/viii/1990, ex *Hopea nutans* (3866), Gen. sl. no. Grc-5645, deposited in FRIM. Paratypes: 1♀, with same data as in holotype except for date emerged, 27/viii/1990; 2♀♀, FRIM, Kepong, Selangor, Malaysia, em. 22/viii/1990, ex *H. odorata* (3726); 1♀ in FRIM and 2♀♀ in EIHU.

Distribution. Malaysia (Malay Peninsula).

Food plants. *Hopea nutans* Ridl. and *H. odorata* Roxb. (Dipterocarpaceae).

Diagnosis. As mentioned in the description, *C. hopeella* is very similar to *C. neobalanocarpi* in colour pattern, but is clearly separated from the latter by the quadrate male valva with a wide concave on the ventral margin between cucullus and sacculus, by the comma-shaped cornutus of the male aedeagus and by the long female antrum.

Notes. This new species is a leaf-miner on *Hopea* spp., while the mine was not discriminated from that of *C. melastigmata* described later, because the moth emerged from the same breeding cases with the latter species.

Chrysocercops lithocarpiella sp. nov.
[Figs. 12(A), 13, 30(C)]

Measurement. ♂♀. Expanse of wings: 4.4-5.4 mm (5.4 mm in holotype, 5.0 mm on average of four specimens). Length of fore wing: 2.1-2.6 mm (2.6 mm in holotype, 2.4 mm on average of five specimens).

Description. ♂♀. Face silvery-whitish, tinged with ochre anteriorly; vertex silvery-gray, with a strong metallic lustre. Palpi ochre-whitish, with apical segment of labial palpus lined with gray on lower surface narrowly. Antenna about 1.2 times as long as fore wing, dark fuscous except for scape and pedicel, which are ochre-whitish wholly. Thorax reddish-brown on dorsum, ochre-brownish on ventrum below wings, with tegulae silvery-gray and usually darker than vertex. All legs ochre-whitish except for hind coxa and apical half of hind femur white; hind tibia slightly darkened towards base laterally; tarsi without any distinct dark ring or band.

Fore wing (Fig. 30: C) ochre-brownish with a metallic lustre in ground colour; basal extremity of costa blackish; a large blackish blotch on costa extending from basal 1/7 to 2/5, nearly expanding to wing-fold, suffusedly irrorated with reddish-brown scales in its central area in holotype, surrounded by a silvery-white, L-shaped mark along its basal and lower margins, the L-shaped mark being detached from hind margin of wing; a white spot on costa at basal 2/5 or just beyond blackish costal blotch, rather round, usually obscure in border, scarcely margined with dark scales in two specimens; a silvery-gray streak extending along wing-fold from middle to apex of wing, expanding on its basal 1/4, then becoming slender and running along wing-margin towards wing-apex; a similar streak running in disc from basal 3/5 to apex, apically expanding and confluent with the hind streak to occupy the whole apical space of wing; these silvery-gray marks tending to become fuscous under some light; cilia around wing-apex uniformly pale ochre-gray without

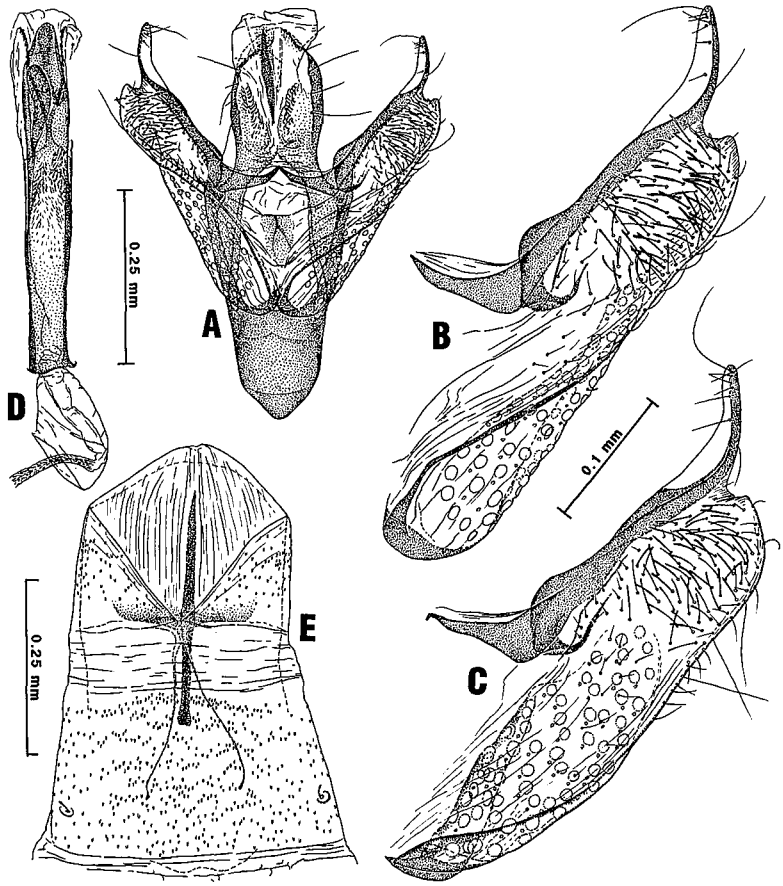


Fig. 13. *Chrysocercops lithocarpiella* sp. nov. A : Male genitalia in caudal view [Grc-5637, holotype] — B : Right valva enlarged [ditto] — C : Ditto [Grc-5622, Mencali F. R., Rompin, Pahang, Malaysia, em. 29/viii/1990, ex *Lithocarpus rassa* (3872)] — D : Aedeagus [holotype] — E : Male seventh and eighth abdominal segments in ventral view [ditto].

any fringe-line, and those along hind margin light gray. Hind wing gray, with cilia light gray.

Male genitalia (Fig. 13). Tegumen and vinculum similar to those of the preceding *C. hopeella*, but saccus a little shorter, about 4/5 as long as lateral arms of vinculum. Valva rather slender, nearly parallel-sided, with cucullus well prolonged, tapering apically and bearing a long apical seta and a few shorter ones ; costa narrowly sclerotized, partly convex near base ; sacculus more or less pointed apically, with a narrow and shallow incision between it and cucullus ; very slightly swollen and truncate setae scattered on apical half of inner surface of sacculus besides normal marginal setae ; long androconial scales scattered on basal half of outer surface of sacculus. Aedeagus slightly longer than valva, tubular, straight, terminating in a tongue-shape, with a Y-shaped projection stretched from about apical 2/5 ; vesica with a spatulate plate-like cornutus in addition to many minute needle-

shaped ones as in *C. neobalanocarpi* ; ductus ejaculatorius short and globose. (Three preparations examined.)

Female genitalia (Fig. 12 : A). Apophyses anteriores rather short, about 1/2 as long as apophyses posteriores. Ostium bursae moderate in opening size, tapering cephalad ; antrum well sclerotized, tubular, 1/3 to 1/2 as long as seventh abdominal sternite. Ductus bursae slender, about as long as or slightly longer than seventh sternite, very sparsely lined with spinules at its cephalic area alone ; corpus bursae elongate-ellipsoidal, much longer than ductus bursae, densely lined with minute comb-shaped spinules mostly around signum, which is a large patch lined with acute, long, needle-shaped spines. (Two preparations examined.)

Specimens examined. 3♂♂ & 2♀♀. Holotype : ♂, Mencali F. R., Rompin, Pahang, Malaysia, em. 29/viii/1990, ex *Lithocarpus rassa* (3872), Gen. sl. no. Grc-5637, deposited in FRIM. Paratypes : 2♂♂ & 2♀♀, with same data as in holotype except for dates emerged, 29-31/viii/1990, 1♂ & 1♀ in FRIM and 1♂ & 1♀ in EIHU.

Distribution. Malaysia (Malay Peninsula).

Food plant. *Lithocarpus rassa* Rehd. (Fagaceae).

Diagnosis. Although *C. lithocarpiella* is an oak-associated species, it is similar to species feeding on dipterocarps such as *C. neopalanocarpi, C. hopeella* and *C. squamosa* rather than to the other known oak-feeder, *C. castanopsidis*, in colour pattern and genital structures. It is distinguished from all the species mentioned above by the larger costal blackish blotch of the fore wing and by the peculiar truncate setae occurring on inner surface of the valva. The presence of these deformed setae on the valva and of a Y-shaped projection on the aedeagus may suggest that *C. lithocarpiella* is most closely related to the following *C. squamosa*, in which the valva bears dense globose or scaly setae on the inner surface.

Notes. The leaf-mine of this new species has not been preserved, but, according to field notes, it is an interparenchymal blotch as in *C. argentata.*

Chrysocercops squamosa sp. nov.
[Figs. 14, 24(A), 30(D)]

Measurement. ♂♀. Expanse of wings : 5.0-6.2 mm (5.8 mm in holotype, 5.58 mm on average of 15 specimens). Length of fore wing : 2.4-3.0 mm (2.7 mm in holotype, 2.66 mm on average of 16 specimens).

Description. ♂♀. Face brilliantly ochre-brownish, tinged with gray posteriorly ; vertex silvery-grayish, with a strong metallic lustre. Palpi ochre-whitish, with apical segment of labial palpus darkened below apically. Antenna about 1.2 times as long as fore wing, dark fuscous except for flattened scape and pedicel, which are ochre-whitish below and ochre-brownish above. Thorax ochre-brownish on dorsum, ochre-whitish on ventrum below wings, with tegulae brilliantly silvery-gray. Legs light ochre-brownish except for whitish hind coxa ; hind tibia blackish on basal half of lateral surface. Abdomen grayish on dorsum, ochre-whitish on ventrum, with a fuscous lateral band along anterior margin of fourth abdominal segment ; seventh segment blackish in both sexes ; eighth segment white in male.

Fore wing (Fig. 30 : D) ochre- to reddish-brown with a metallic lustre in ground colour ; a minute, blackish spot placed on costa near base ; a blackish streak

extending along costa from basal 1/9 to 1/3, occupying about 1/3 width of wing, always interrupted by a convexity of a large silvery-gray blotch, which occupies the whole hind area below the blackish streak ; the silvery-gray blotch edged with ochre-white along its basal margin clearly and along its apical margin obscurely ; a silvery-white spot placed on costa just before middle of wing, rather elongate along costa, narrowly margined with black basally and apically ; apical half of wing occupied by a silvery-gray mark, which sometimes tends to become dark fuscous

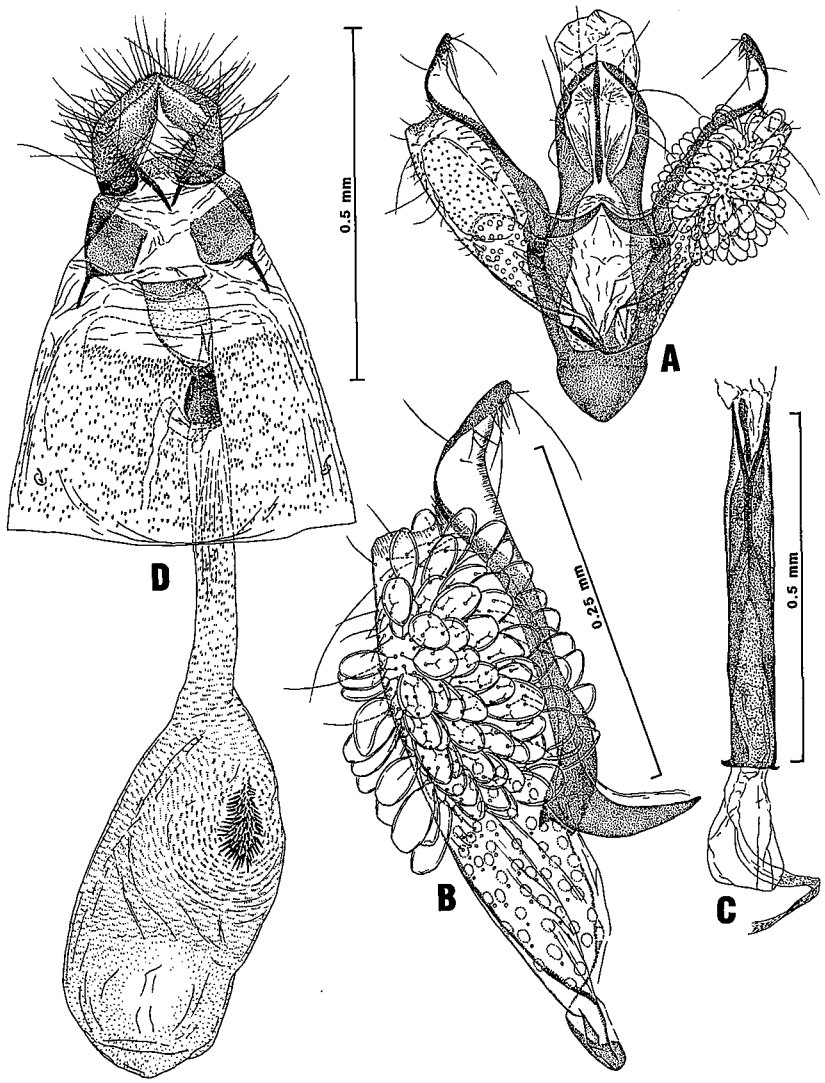


Fig. 14. *Chrysocercops squamosa* sp. nov. A : Male genitalia in caudal view, aedeagus omitted [Grc-5640, holotype] — B : Left valva enlarged [ditto] — C : Aedeagus [ditto] — D : Female genitalia in ventral view [Grc-5609, Sg. Pandan F. R., nr. Kuantan, Pahang, Malaysia, em. 28/ix/1990, ex *Vatica pallida* (4081)].

under some light, basal margin of this mark being oblique inwardly from costa and acutely indented by ground colour in disc; cilia around apex of wing light ochre-gray, those along hind margin light gray, without any fringe-line. Hind wing gray, with cilia light gray.

Male genitalia (Fig. 14: A-C). Tegumen shortly spatulate in ventral view, narrowly sclerotized laterally, with ventral surface bare without spinules; about six slender setae occurring along ventral margin of each lateral sclerite; tuba analis with a slender subscaphium. Vinculum nearly V-shaped in ventral view, with saccus subtriangular and about 1/2 as long as lateral arms. Valva somewhat elongate-elliptical, with cucullus moderately protruded, bent inwardly and widened basally; costa narrowly sclerotized, weakly sinuate; sacculus slightly arched centrally, angulated apically, with a wide and shallow concavity between it and cucullus; large, globose or scaly setae occurring on inner surface of sacculus rather densely in addition to normal, slender marginal ones; long androconial scales scattered on basal half of outer surface of sacculus. Aedeagus a little longer than valva, tubular, straight, tapering apically, with a Y-shaped projection stretched from middle; vesica with a weakly sclerotized, bar-shaped cornutus and without needle-shaped ones; ductus ejaculatorius short, globose. (Two preparations examined.)

Female genitalia (Fig. 14: D). Apophyses anteriores nearly as long as apophyses posteriores. Ostium bursae moderate in opening size, about 1.5 times as long as antrum, tapering cephalad; sclerotized antrum shortly tubular, slightly dilated cephalad. Ductus bursae long, tubular, about 1.5 times as long as seventh abdominal sternite, lined with spinules on cephalic 2/3 rather sparsely; corpus bursae ellipsoidal, slightly longer than ductus bursae, lined with comb-like spinules on its caudal 2/3, especially densely around signum, which is oblong and lined with short, needle-shaped spines. (Three preparations examined.)

Specimens examined. 8♂♂ & 9♀♀. Holotype: ♂, Desaru, Kota Tinggi, Johor, Malaysia, em. 3/ix/1990, ex *Vatica pauciflora* (3891), Gen. sl. no. Grc-5640, deposited in FRIM. Paratypes: 7♂♂ & 8♀♀, with same data as in holotype except for dates emerged, 1-4/ix/1990; 1♀, Sg. Pandan F. R., near Kuantan, Pahang, em. 28/ix/1990, ex *V. pallida* (4081); 3♂♂ & 4♀♀ in FRIM and 4♂♂ & 5♀♀ in EIHU.

Distribution. Malaysia (Malay Peninsula).

Food plants. *Vatica pallida* Dyer and *V. pauciflora* King (Dipterocarpaceae).

Diagnosis. As stated under the preceding *C. lithocarpiella, C. squamosa* is very closely related to *C. lithocarpiella* in having deformed setae on the valva and a Y-shaped projection on the aedeagus. It is, however, distinguished at once not only from *C. lithocarpiella* but also from the other species of the genus by the squamose valva and by the unique premedian colour-patterns of the fore wing.

Notes. The leaf-mine of the present new species is at first a linear gallery occurring on lower surface of leaves. Then it is changed into an interparenchymal blotch usually lying along leaf-margin. The mining part of leaf is discoloured into brown, sometimes into dark brown in matured condition in a sharp contrast to the healthy greenish part. Pupation took place outside mines, and, in my breeding, usually in a furrow of the breeding case. The cocoon is boat-shaped, ochre-whitish, and covered by two to four minute bubbles.

Chrysocercops shoreae sp. nov.

[Figs. 15, 16(A), 24(B), 27(A), 30(E)]

Measurement. ♂♀. Expanse of wings: 5.0-6.6 mm (6.5 mm in holotype). Length of fore wing: 2.4-3.2 mm (3.1 mm in holotype).

Description. ♂♀. Face and vertex brilliantly silvery-gray, a little lighter and tinged with ochreous in face anteriorly. Maxillary palpus ochre-whitish; labial palpus ochre-whitish mesally and pale ochre-brownish laterally. Antenna about 1.3 times as long as fore wing, dark fuscous except for pale ochre-brownish scape. Thorax with dorsum including tegulae dark silvery-gray, darker than vertex, the ventrum below wings being ochre-brownish. Legs ochreous, with median area of fore coxa, basal half of hind coxa and basal half of hind femur whitish; hind tibia medianly and first segment of hind tarsus wholly darkened laterally. Abdomen grayish on dorsum, with ventrum fuscous on basal half and whitish on apical half except for seventh sternite which is ochreous with a blackish apex.

Fore wing (Fig. 30: E) ochre- to orange-brownish with a metallic lustre in ground colour; basal extremities of costal and hind margins shortly silvery-gray; a silvery-whitish, triangular fascia placed at basal 1/5, widened towards hind margin, shading into ground colour on hind side of its basal margin, and scarcely margined with black on the costal side; a large black blotch placed on costa just beyond the triangular fascia, oblong or elongate-rectangular, extending from basal 1/5 to middle of wing, occupying about 1/3 width of wing; a silvery-gray blotch occupying almost whole hind space below the blackish costal blotch, forming together with this a very wide and dark fascia, slightly narrowing towards hind margin; a silvery-white spot placed on costa just beyond black blotch or at middle of wing; apical 1/3 of wing occupied by a silvery-gray mark which tends to become dark fuscous under some light, the basal margin being strongly oblique inwardly from basal 4/5 of costa to basal 2/3 of hind margin; a silvery-whitish, ill-defined spot placed on hind margin just before the silvery-gray apical mark; cilia around apex and along termen pale brownish-gray, without any fringe-line, and those along hind margin pale gray. Hind wing gray, with cilia pale gray.

Male genitalia (Fig. 15). Tegumen reversedly U-shaped in outline in ventral view, weakly sclerotized laterally, with about ten slender setae of various length occurring along ventral margin of each lateral sclerite, and without spinules on ventral surface; tuba analis with a slender subscaphium. Vinculum narrowly U-shaped in ventral view, with lateral arms rather long, a little longer than tegumen; saccus short, nearly 1/3 as long as lateral arms, somewhat trapeziform in ventral view. Valva rather slender, with cucullus well protruded, slightly swollen and bearing three long and about ten shorter setae along twisted ventral margin; costa narrowly sclerotized, widely lobated near base; sacculus round basally, obtusely angulated apically, with a rather deep, round incision between it and cucullus; short, fine setae aggregated near apex of sacculus in addition to normally long, sparse setae; long androconial scales occurring on basal 2/3 of outer surface rather densely. Aedeagus about as long as valva, tubular, terminating in a narrow tongue-shaped sclerite; vesica with a strong, hook-shaped cornutus in addition to a bundle of needle-shaped ones; ductus ejaculatorius short, globose. Anterior apodeme of

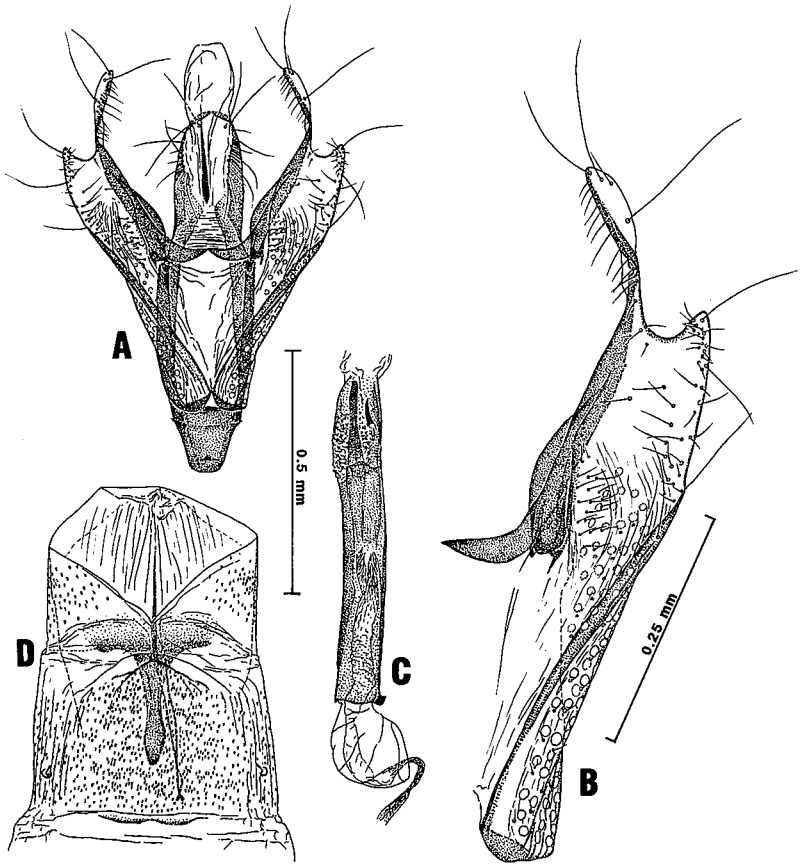


Fig. 15. *Chrysocercops shoreae* sp. nov. A : Male genitalia in caudal view, aedeagus omitted [Grc-5630, holotype] — B : Right valva enlarged [ditto] — C : Aedeagus [ditto] — D : Male seventh and eighth abdominal segments in ventral view [ditto].

eighth abdominal tergite swollen near apex, with dorsal ridge of the tergite very narrow and sometimes indistinct. (Two preparations examined.)

Female genitalia (Fig. 16 : A). Apophyses posteriores about as long as apophyses anteriores. Ostium bursae surrounded by a large genital plate, of which the lamella postvaginalis is semicircular and the lamella antevaginalis is rather transversely trapeziform with imbricate wrinkles on its cephalic area. Antrum well sclerotized together with ostium bursae, about 1/3 as long as seventh sternite, rather thick, tubular, slightly protuberant at cephalic side. Ductus bursae long, about twice as long as seventh sternite, longitudinally striated and weakly sclerotized on its caudal half, not lined with spinules ; corpus bursae globose or pyriform, shorter than ductus bursae, with minute comb-shaped spinules arranged in an imbricate pattern around signum, which is rather large, oblong and densely lined with needle-shaped spines. (One preparation examined.)

Specimens examined. 3♂♂ & 1♀. Holotype : ♂, Rantau Abang, Terengganu, Malaysia, em. 22/viii/1990, ex *Shorea materialis* (3747), Gen. sl. no. Grc-5630,

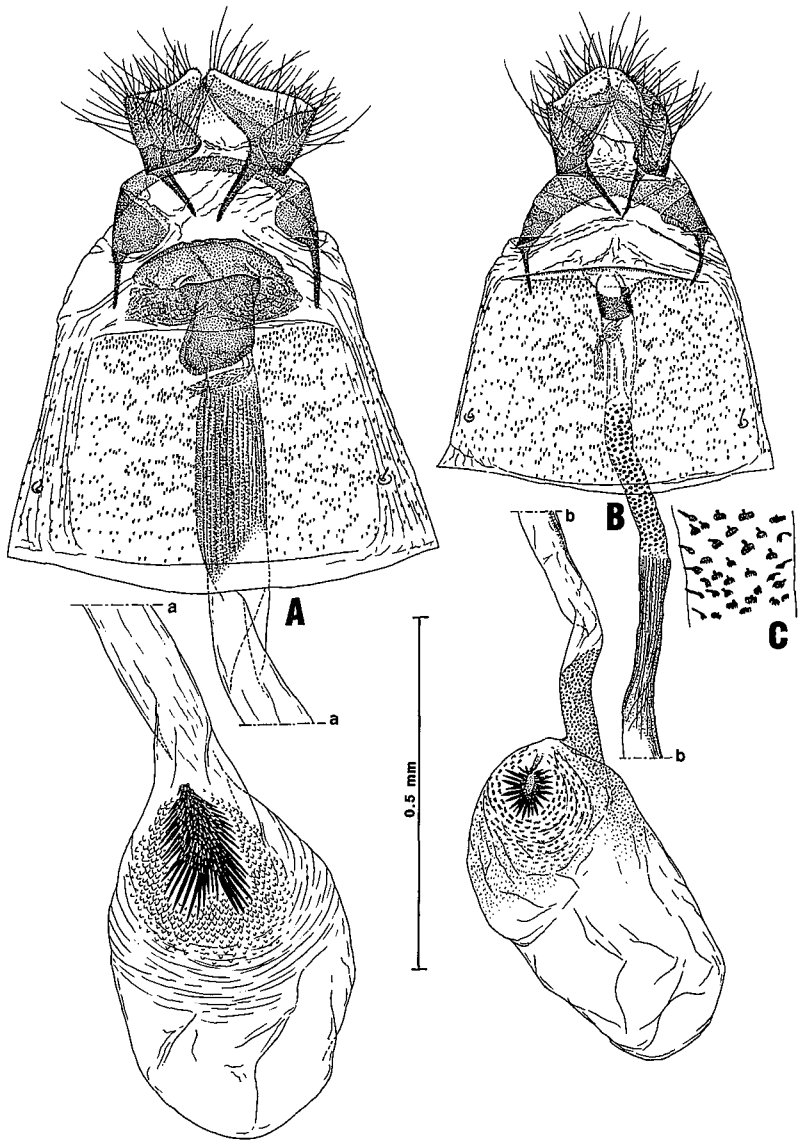


Fig. 16. A: *Chrysocercops shoreae* sp. nov., female genitalia in ventral view [Grc-5631, Rantau Abang, Terengganu, Malaysia, em. 21/viii/1990, ex *Shorea materialis* (3747)]. B-C: *Chrysocercops melastigmata* sp. nov. B: Female genitalia in ventral view [Grc-5612, Mencali F. R., Rompin, Pahang, Malaysia, em. 2/ix/1990, ex *Hopea nutans* (3865)] — C: A part of ductus bursae at caudal 2/5, showing comb-like spinules [ditto].

deposited in FRIM. Paratypes: 1♂ & 1♀, with same data as in holotype except for dates emerged, 21-25/viii/1990; 1♂, Mencali F. R., Rompin, Pahang, Malaysia, em. 1/ix/1990, ex *S. materialis* (3875); 1♂ in FRIM and 1♂ & 1♀ in EIHU.

Distribution. Malaysia (Malay Peninsula).

Food plant. *Shorea materialis* Ridl. (Dipterocarpaceae).

Diagnosis. *C. shoreae* is very impressive in having a whitish, triangular subbasal blotch; by this character it is easily distinguished from any other members of the genus *Chrysocercops*. It is also separated from the members of the *castanopsidis*-group by the deep incision of the valva between the cucullus and sacculus in the male genitalia and by the large genital plate in the female genitalia. These genital characters suggust that it is rather isolated from the other known members of the *castanopsidis*-group.

Notes. Adult specimens of *C. shoreae* emerged from larvae mining in leaves of *Shorea materialis*, which is limited in distribution to the east coast of Peninsular Malaysia. The mine is at first a linear gallery occurring on the lower surface of leaf and running mostly along leaf-veins. When it reaches the leaf-margin, it is broadened along the margin to form an elongate blotch. When full-grown, the mining part of the leaf is folded downward. Pupation took place outside the mine. In the breeding case the cocoon was placed at a furrow on the wall; it is boat-shaped, ochreous in colour, and covered by two or three minute bubbles on the upper surface.

Chrysocercops melastigmata sp. nov.

[Figs. 16(B-C), 17, 24(C), 31(A)]

Mesurement. ♂♀. Expanse of wings: 4.7-5.7 mm (5.7 mm in holotype, 5.05 mm on average of 20 specimens). Length of fore wing; 2.1-2.7 mm (2.7 mm in holotype, 2.37 mm on average of 20 specimens).

Description. ♂♀. Face silvery-whitish, vertex silvery-gray, both with a strong metallic lustre. Palpi whitish, with apical segment of labial palpus narrowly darkened on ventral surface. Antenna about 1.3 times as long as fore wing, ochre-grayish, becoming blackish towards apex, with scape whitish below and silvery-grayish above. Thorax silvery-gray, much darker on dorsum including tegulae, with a strong metallic lustre. Legs ochre-whitish, with two median spots of fore tibia, apex of mid tibia and an oblique line on hind trochanter blackish; hind tibia dark fuscous laterally except for base; interior spur at subbase of hind tibia blackish at its middle, and the other spurs dark fuscous laterally; all tarsi white, with three blackish rings. Abdomen grayish dorsally, whitish ventrally, with two fuscous, oblique ventral lines near base and two similar but shorter ones near apex; anal extremity (eighth segment) ochre-whitish in male.

Fore wing (Figs. 24: C; 31: A) with a basal trace of vein R_1; basal half of wing silvery-whitish and the apical half ochre- or orange-brownish in ground colour, both the areas with a brilliantly metallic lustre, and the border between them being shortly protruded towards apex in disc; base of wing darkened, somewhat becoming fuscous especially along costa for a short distance; a large blackish blotch on costa extending from basal 1/5 to middle of wing, occupying about half width of wing, elongate-quadrate, oblique outwardly from costa on its anterior margin; hind space

below this blackish blotch tending to become fuscous under some light, forming together with the blackish blotch a very wide, dark fascia, somewhat narrowing below; a narrow silvery-whitish projection protruded beyond this dark fascia in disc, scarcely margined with fuscous scales apically; a silvery white spot placed at tornus or apical 1/4 of hind margin of wing, semicircular or trapeziform, surrounded by black scales narrowly; a white spot on costa near apex of wing, as large as or slightly larger than the tornal spot, margined with black scales anteriorly; apical space of wing beyond this white costal spot wholly occupied by a blackish mark; cilia around blackish apex of wing blackish basally and whitish apically, with a short, blackish apical hook; cilia along termen pale gray with a fuscous median fringe-line which is parallel to the termen; cilia along hind margin wholly light gray.

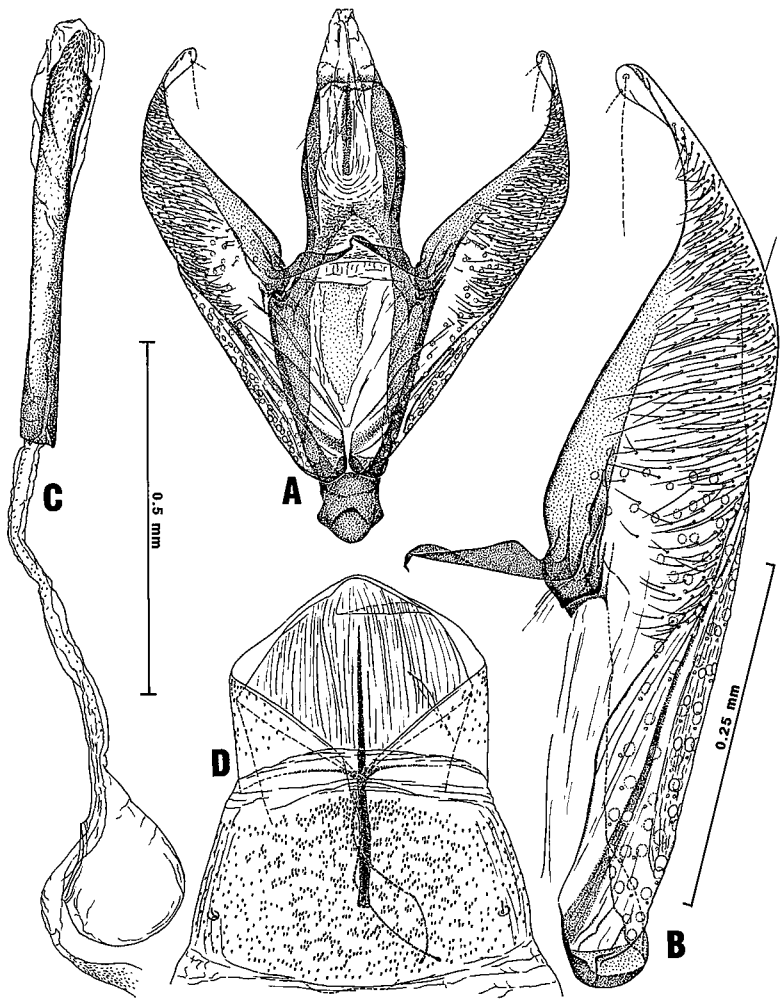


Fig. 17. *Chrysocercops melastigmata* sp. nov. A: Male genitalia in caudal view, aedeagus omitted [Grc-5627, holotype] — B: Right valva enlarged [ditto] — C: Aedeagus [ditto] — D: Male seventh and eighth abdominal segments in ventral view [ditto].

Hind wing gray, with cilia light gray.

Male genitalia (Fig. 17). Tegumen moderate in length, spatulate in ventral view, but rather truncate, laterally sclerotized narrowly, with a long apical seta and a few shorter and slender median ones along ventral margin of each lateral sclerite; tuba analis with a narrow subscaphium. Vinculum V-shaped in ventral view, with lateral arms about as long as tegumen, widened dorsally; saccus short, shorter than 1/3 length of lateral arms, somewhat pentagonal in ventral view. Valva a little longer than twice length of tegumen, gradually tapering towards narrowly protruded cucullus without any gap between cucullus and sacculus; cucullus more or less twisted outwardly, with two apical setae; dense, slender setae occurring on apical 2/3 of inner surface of sacculus, and long androconial scales on basal half of the outer surface. Aedeagus a little shorter than valva, tubular, obliquely truncate apically, serrulate along the oblique apical edges; vesica with many minute, needle-shaped, cornuti, most of which are aggregated around apex of aedeagus; ductus ejaculatorius long, about 1.4 times as long as aedeagus, well swollen distally. (Two preparations examined.)

Female genitalia (Fig. 16: B-C). Ostium bursae small in opening size, tapering cephalad; antrum shortly sclerotized, ring-shaped, about 1/10 as long as seventh abdominal sternite. Ductus bursae about 3 times as long as seventh sternite, narrowly tubular, with its basal 1/5 simply membraneous, the second basal 1/5 densely lined with comb-shaped spinules as shown in Fig. 16: C, the third 1/5 longitudinally striated rather densely, the fourth 1/5 simply membraneous, and the last 1/5 lined with thorn like spinules densely. Corpus bursae a little longer than 1/2 length of ductus bursae, ellipsoidal, lined with comb-shaped spinules around an oblong signum, which is placed near the caudal end of the corpus and surrounded by about 20 needle-shaped spines. (Two preparations examined.)

Specimens examined. 19♂♂ & 19♀♀. Holotype: ♂, Mencali F. R., Rompin, Pahang, Malaysia, em. 27/viii/1990, ex *Hopea nutans* (3865), Gen. sl. no. Grc-5627, deposited in FRIM. Paratypes: 12♂♂ & 11♀♀, with same data as in holotype except for dates emerged, 27/viii-3/ix/1990; 6♂♂ & 8♀♀, Ditto, em. 27/viii-7/ix/1990, ex *H. nutans* (3866 and 3877); 9♂♂ & 10♀♀ in FRIM and 9♂♂ & 9♀♀ in EIHU.

Distribution. Malaysia (Malay Peninsula).

Food plant. *Hopea nutans* Ridl. (Dipterocarpaceae).

Diagnosis. *C. melastigmata* belongs to the *malayana*-group together with the succeeding three species. It is readily distinguished from the species described above by the unique colour-pattern of the fore wing: the mainly silvery basal half and the largely brownish apical half, with two fringe-lines around the apex. It is also separated from the succeeding three species by the simple valva without any comb or pecten of setae in male and by the unique lining pattern of the long ductus bursae in female. These genital characters suggest that it is a rather isolated species in the *malayana*-group.

Notes. This new species emerged from larvae mining in leaves of *Hopea nutans* collected at Mencali Forest Reserve near Kuala Rompin together with *C. argentata* and *C. hopeella*. These three species even emerged from the same breeding stocks (breeding nos. 3865 and 3866). Therefore, further careful studies are necessary to discriminate the mines of these species.

Chrysocercops thapai sp. nov.
[Figs. 18, 19, 24(D), 27(B), 31(B)]

Measurement. ♂♀. Expanse of wings: 5.7-7.0 mm (6.3 mm in hololtype, 6.5 mm on average of five specimens). Length of fore wing: 2.8-3.4 mm (3.0 mm in holotype, 3.12 mm on average of seven specimens).

Description. ♂♀. Face silvery-whitish; vertex silvery- grayish with a strong golden lustre under some light. Palpi whitish. Antenna ochre-grayish, darkened towards apex, with scape whitish. Thorax silvery-grayish both on ventrum and dorsum including tegulae, the dorsum being tinged with a golden lustre. Legs whitish, with hind tibia ochreous laterally except for its base and apex; all tarsi with four or five narrow, ochreous rings. Abdomen grayish dorsally, whitish ventrally, with five ochrous, oblique lateral bands each on third to seventh segments.

Fore wing (Figs. 24: D; 31: B) with a short trace of vein R_1 as in *C. melastigmata*; ground colour of basal half silvery-gray with a strong golden lustre and that of apical half orange-brownish, with the border between them more or less angulated outward and irrorated with brownish scales in disc; base of costa slightly darkened; a dark brownish blotch extending on costa from basal 1/4 to 2/5 of wing within silvery-gray basal area, expanding nearly to wing-fold, suffused with orange-brownish scales in its centre; hind space below this costal blotch more or less darkened, forming together with the costal blotch a wide, oblique dark fascia; a silvery-gray spot placed before tornus, wide-triangular or semicircular, sometimes tending to become golden colour under some light, and margined with dark brownish scales; a pair of minute, white costal and hind spots placed just before apex of wing; a round black spot placed on apical space between paired white spots and subapex of wing; apical extremity shortly silvery-gray with a golden lustre; cilia around apex of wing blackish basally and whitish apically, with a short dark hook produced downward; cilia along termen ochreous except for a white dash stretched from white spot, with a dark median fringe-line running in parallel with termen; cilia along hind margin light gray. Hind wing gray, with cilia light gray.

Male genitalia (Fig. 18). Tegumen long, spatulate in ventral view, covered by dense spinules on ventral surface, with five to six bristly setae along ventral margin of each lateral sclerite apically; tuba analis with a very narrow subscaphium. Vinculum U-shaped in ventral view, with lateral arms long, about as long as tegumen; saccus short, round apically. Valva about 2.2 times as long as tegumen, slender, with cucullus well protruded, long, slender, bent at its middle and sparsely covered by slender setae of various length; costa narrowly sclerotized, slightly arched; sacculus well prolonged towards round base, shortly protruded and narrowly round apically, with a comb having thick, short and truncate teeth, which are arranged along the ventral margin of the protruded apex; slender setae scattered on inner surface inside the comb; long androconial scales occurring on outer surface of sacculus very densely. Aedeagus tubular, straight, about 2/3 as long as valva, slightly swollen at middle, then terminating in a slender, acute plate; vesica with minute needle-shaped cornuti; ductus ejaculatorius short, globose. (Two preparations examined.)

Female genitalia (Fig. 19). Apophyses anteriores slightly longer than apo-

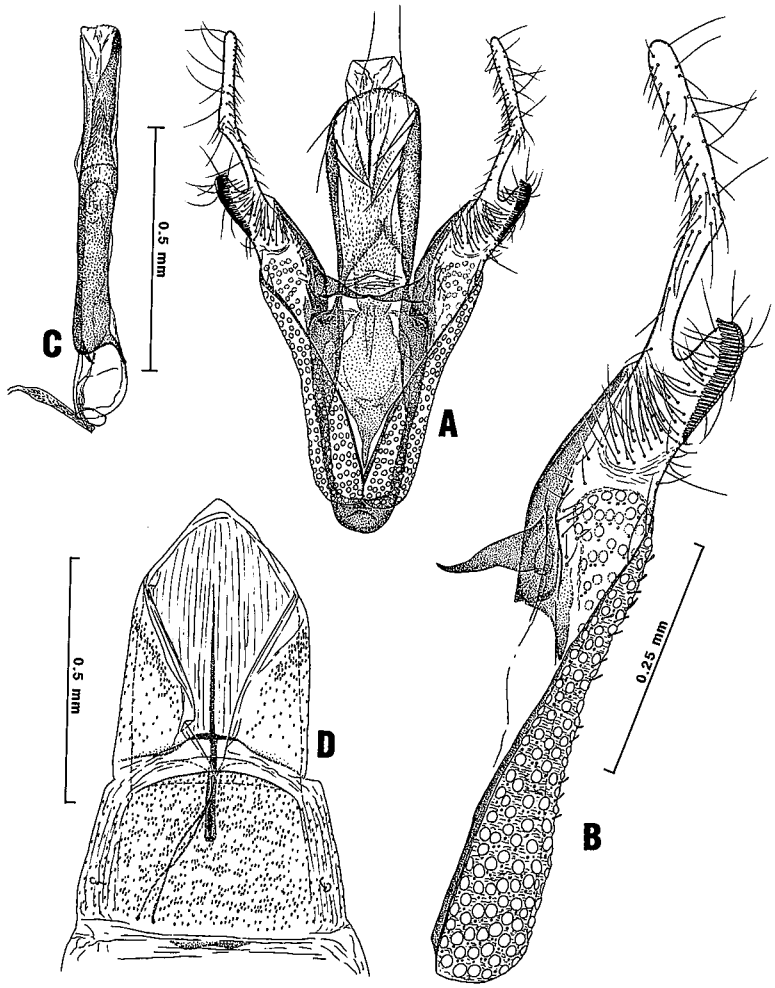


Fig. 18. *Chrysocercops thapai* sp. nov. A: Male genitalia in caudal view, aedeagus omitted [Grc-5665, holotype] — B: Right valva enlarged [ditto] — C: Aedeagus [ditto] — D: Male seventh and eighth abdominal segments in ventral view [ditto].

physes posteriores. Ostium bursae moderate in opening size, tapering cephalad; sclerotized antrum shortly ring-shaped, shorter than 1/5 length of seventh abdominal sternite. Ductus bursae slender, tubular, nearly twice as long as seventh sternite, with its caudal half simply membraneous and its cephalic half longitudinally striated and lined with sparse spinules; corpus bursae elongate-pyriform, very sparsely lined with fine spinules mostly around signum, which is elongate-pyriform and is lined with large lanceolate sclerites, the sclerites being serrulated along their margins. (One preparation examined.)

Specimens examined. 5♂♂ & 2♀♀. Holotype: ♂, Pathraia (alt. 300 m), Terai Forest, Narayani, Nepal, em. 24/ix/1983, ex *Shorea robusta* (Npl-472), Gen. sl. no. Grc-5665, deposited in EIHU. Paratypes: 2♂♂ & 1♀, with same data as in

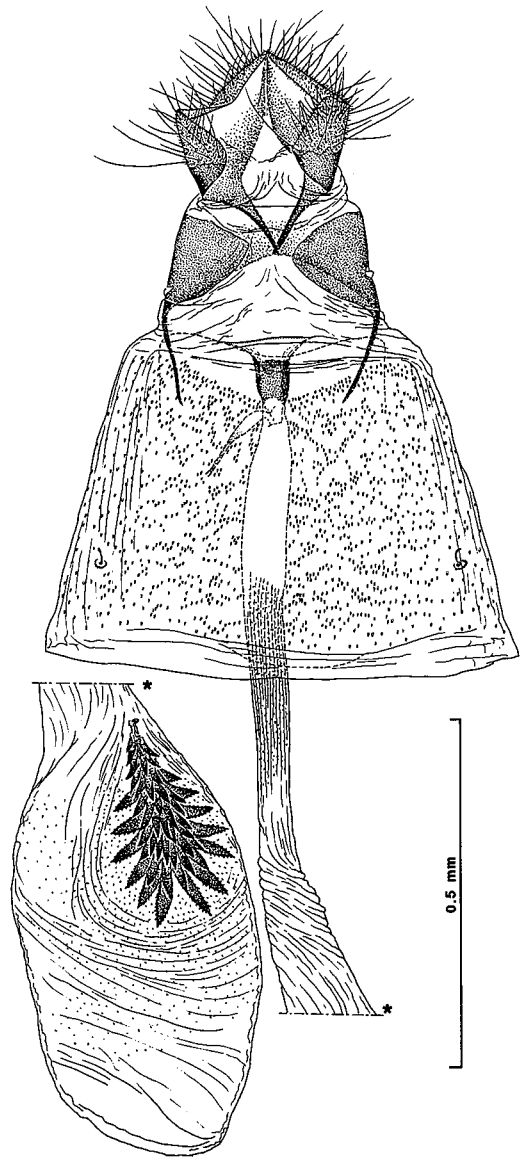


Fig. 19. *Chrysocercops thapai* sp. nov., female genitalia in ventral view [Grc-3268, Narayangarh, Terai Forest, Nepal, em. 6/viii/1983, ex *Shorea robusta* (Npl-253)].

holotype except for dates emerged, 22-24/ix/1983 ; 2♂♂ & 1♀, Narayangarh (alt. 300 m), Narayani, em. 6-9/viii/1983, ex *S. robusta* (Npl-253) ; 2♂♂ & 1♀ in EDAK and 2♂♂ & 1♀ in EIHU.

Distribution. Nepal.

Food plant. *Shorea robusta* Gaertn. (Dipterocarpaceae).

Diagnosis. *C. thapai* is somewhat similar to the preceding *C. melastigmata* in

the colour pattern of the fore wing, but can easily be separated from the latter by the peculiar shape of the valva with a comb and by the signum uniquely lined with lanceolate and serrulate sclerites.

Notes. *C. thapai* emerged from larvae mining in leaves of *Shorea robusta*, together with *C. argentata*, in Terai Forest, Nepal. But its leaf-mine is very different from that of *C. argentata*, being at first a linear gallery occurring on the lower or rarely upper surface of leaf. Later on, after reaching the leaf-margin, it is broadened into a blotch usually elongate along the margin. Finally, in mature condition, the leaf margin with the mine is folded downward or rarely upward as seen in *C. azmii* and *C. shoreae*.

The present new species is named in honour of Dr. V. K. Thapa of the Tribhuvan University, Kathmandu, Nepal.

Chrysocercops malayana sp. nov.
[Figs. 20, 21(A), 24(E), 25(B), 27(C-D), 31(C)]

Measurement. ♂♀. Expanse of wings: 5.0-7.0 mm (5.6 mm in holotype, 6.04 mm on average of 11 specimens). Length of fore wing: 2.4-3.3 mm (2.6 mm in holotype, 2.80 mm on average of 12 specimens).

Description. ♂♀. Face silvery-whitish; vertex silvery-grayish, with a strong metallic lustre. Palpi whitish mesally, ochre-whitish laterally, with labial palpus darkened apically. Antenna about 1.5 times as long as fore wing, light ochre-brownish, becoming darker towards apex. Thorax brilliantly silvery-gray, darker on dorsum including tegulae. Legs whitish to ochre-whitish; fore and mid tibiae with two blackish rings one at subapex and the other at apex; hind tibia laterally ochre-brownish except for its apical area which is whitish with a blackish apical ring; all tarsi with four or five blackish rings. Abdomen grayish dorsally, whitish ventrally, with five oblique ochreous bands each on third to seventh segments.

Fore wing (Fig. 31: C) with vein R_1 completely absent; ground colour ochre- or orange-brownish, with a metallic lustre; base of costa silvery-gray, followed by a dark fuscous blotch which shades into ground colour outward; a brilliantly ochreous-gray to silvery-gray streak extending along hind margin from base to middle, occupying almost whole hind area below wing-fold, but its apical 1/3 expanding beyond wing-fold, bordered with a blackish costal blotch on its upper edge before its apex and also with a smaller blackish spot at its apex, these blackish blotch and spot being usually detached from costal margin of wing; a silvery-gray spot placed just before tornus, rather elongate along hind margin, bordered with two blackish spots on its upper edge, one at apex and the other at base; a small blackish hind spot at middle of termen; a white spot on costa opposite the last blackish hind spot, narrowly margined with black; subapical space of wing between white costal spot and subapex occupied by a rectangular black blotch, beyond which the apical extremity of the wing is silvery-grayish; cilia around apex and along termen fuscous to blackish basally and whitish apically, with two fringe-lines, one running along termen and another forming a hook; cilia along hind margin light gray, shading into brown towards wing-margin. Hind wing gray, with cilia light gray.

Male genitalia (Fig. 20). Tegumen long, spatulate in ventral view, covered by dense spinules on ventral surface, apically with six to eight bristly setae along each

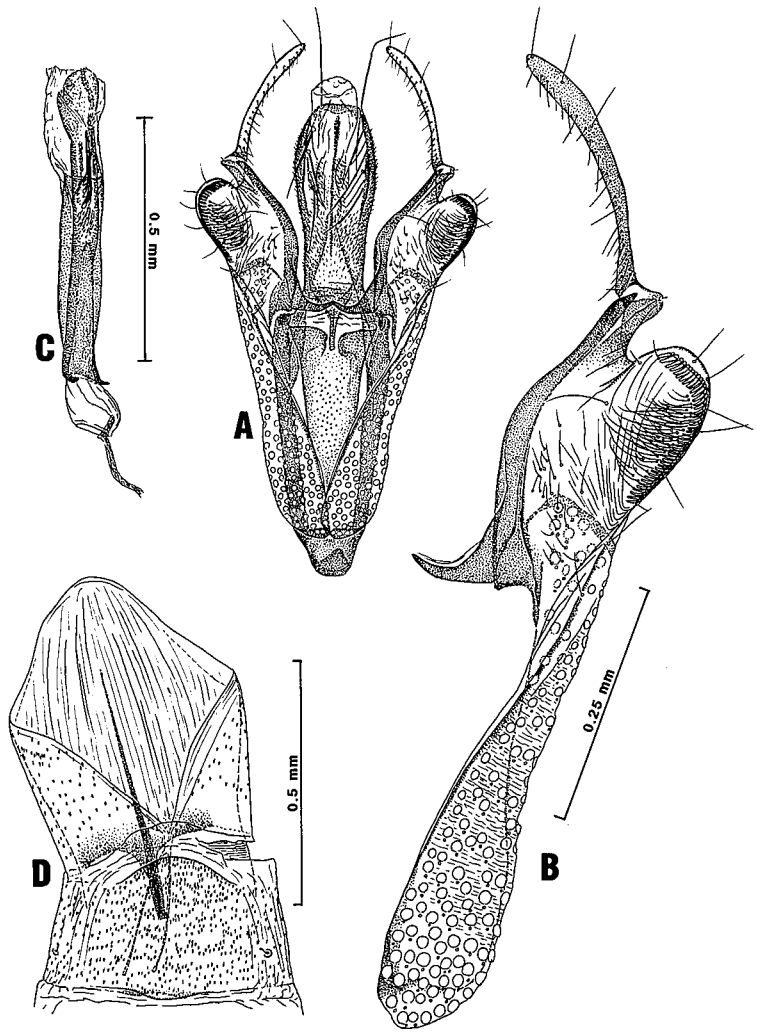


Fig. 20. *Chrysocercops malayana* sp. nov. A : Male genitalia in caudal view, aedeagus omitted [Grc-5636, holotype] — B : Right valva enlarged [ditto] — C : Aedeagus [ditto] — D : Male seventh and eighth abdominal segments in ventral view [ditto].

lateral sclerite ; tuba analis with a slender subscaphium. Vinculum U-shaped, with lateral arms nearly as long as tegumen ; saccus short, round apically. Valva slender, about 2.5 times as long as tegumen, with cucullus well protruded, slender, with a small subbasal protuberance on its ventral margin, and with short, slender setae mostly along its costal margin ; costa narrowly sclerotized, arched ; sacculus well prolonged towards round base, apically protruded and widely round, with a comb having thick, short and truncate teeth which are arranged along apical and ventral margins of protruded apex as in *C. thapai* ; slender setae scattered inside the comb ; long androconial scales occurring on outer surface of sacculus very densely. Aedeagus about 3/5 as long as valva, tubular, straight, with a narrow projection at

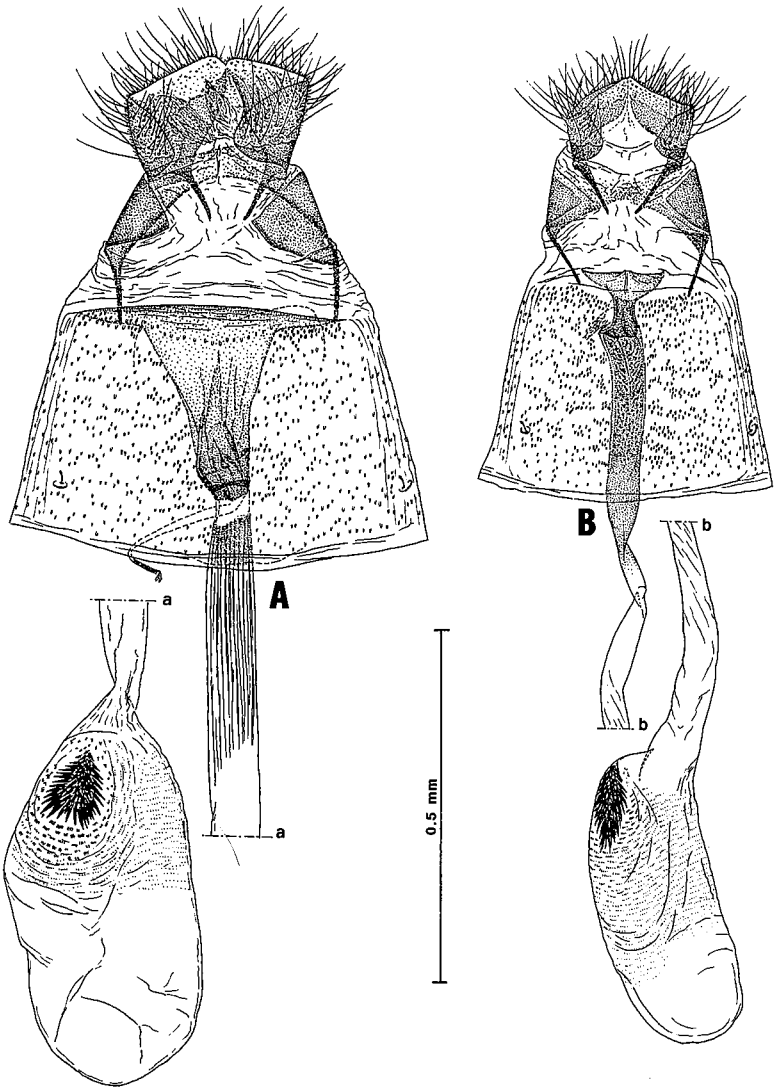


Fig. 21. A : *Chrysocercops malayana* sp. nov., female genitalia in ventral view [Grc-3847, FRIM, Kepong, Selangor, Malaysia, em. 19/viii/1986, ex *Shorea* sp. (2609)].
B : *Chrysocercops pectinata* sp. nov., female genitalia in ventral view [Grc-5623, Beserah F. R., Kuantan, Pahang, Malaysia, em. 27/viii/1990, ex *Dipterocarpus grandifolius* (3853)].

a side, the projection being covered by acute spines ; vesica with a double or triple row of triangular minute cornuti and a bundle of needle-shaped ones ; ductus ejaculatorius short, globose. (Three preparations examined.)

Female genitalia (Fig. 21 : A). Apophyses anteriores nearly as long as apophyses posteriores. Ostium bursae very large in opening size, about 2/3 as long as seventh abdominal sternite, tapering cephalad, sparsely striated ; sclerotized antrum

weakened towards ostium bursae, shortly ring-shaped, shorter than 1/5 length of seventh sternite. Ductus bursae narrowly tubular, about 1.5 times as long as seventh sternite, longitudinally striated on its caudal 2/3, then smoothly membraneous on its remaining cephalic 1/3. Corpus bursae ellipsoidal or elongate-pyriform, a little shorter than ductus bursae, lined with comb-shaped spinules around signum, which is pyriform and densely lined with small thorn-like spines. (Three preparations examined.)

Specimens examined. 5♂♂ & 7♀♀. Holotype: ♂, Tasik Cini, Pekan, Pahang, Malaysia, em. 28/viii/1990, ex *Shorea leprosula* (3824), Gen. sl. no. Grc-5636, deposited in FRIM. Paratypes: 4♂♂, FRIM, Kepong, Selangor, em. 18-23/viii/1986, ex *Shorea* sp. (2609); 4♂♂ & 2♀♀, Ditto, em. 29/ix-25/x/1986, ex *S. bracteolata* (2779); 1♀, Pasoh F. R., Negeri Sembilan, Malaysia, em. 23/viii/1986, ex *S. acuminata* (2622); 2♂♂ & 3♀♀ in FRIM and 2♂♂ & 4♀♀ in EIHU.

Distribution. Malaysia (Malay Peninsula).

Food plants. *Shorea* spp. including *S. acuminata*, *S. bracteolata* Dyer and *S. leprosula* Miq. (Dipterocarpaceae).

Diagnosis. *C. malayana* is undoubtedly the closest species to *C. thapai* among the known species of the genus in the shape of the valva with an elongate comb. But it can be distinguished from *C. thapai* by the fore wing with blackish marks in addition to a subapical blotch, by the wider apex of the sacculus of the valva, by the subbasal protuberance of the cucullus of the valva, by the signum lined with simple and smaller spines and by the longer ostium bursae. Both the species are associated with *Shorea* spp., but they may be allopatric in distribution, *C. malayana* occuring in Malaysia, while *C. thapai* in Nepal.

Notes. *C. malayana* emerged from larvae mining in leaves of various species of the genus *Shorea* in Malay Peninsula. Leaf-mines are very similar to those of *C. thapai* in all respects, but they are mostly located on the upper surface, and not on the lower surface as in *C. thapai*.

Chrysocercops pectinata sp. nov.
[Figs. 21(B), 22, 24(F), 31(D)]

Measurement. ♂♀. Expanse of wings: 4.9 mm. Length of fore wing: 2.3 mm.

Description. ♂♀. Face silvery-whitish; vertex brilliantly silvery-gray. Maxillary palpus whitish, with a blackish ring at apex of second segment. Labial palpus whitish mesally, light grayish laterally, somewhat darkened apically. Antenna about 1.3 times as long as fore wing, grayish, darkened towards apex, with scape whitish below. Thorax silvery-gray, darker on dorsum including tegulae. Legs ochreous except for whitish coxae and tarsi; anterior four tibiae with two blackish rings one at middle and the other at apex; hind tibia fuscous laterally except for apical extremity; all tarsi with three blackish rings nearly equidistantly.

Fore wing (Figs. 24: F; 25: D) with vein M_2 shortly stalked with M_3; ground colour of basal 2/5 silvery-grayish tinged with ochre, and that of remaining apical 3/5 ochre- or orange-brownish, with the border between them narrowly blackish to form an inward-oblique fascia; a large, blackish costal blotch situated within basal grayish area, extending from base to basal 1/3 of wing, expanding nearly to

wing-fold, and strongly narrowed downward; hind area below this blackish blotch somewhat darkened under some light, forming together with the blackish blotch a wide, dark fascia; a blackish fascia placed at middle of wing just beyond blackish border-line, much wider than the border-line, oblique outwardly, leaving a narrow, triangular, ochreous mark between them; a silvery-whitish hind spot placed at basal

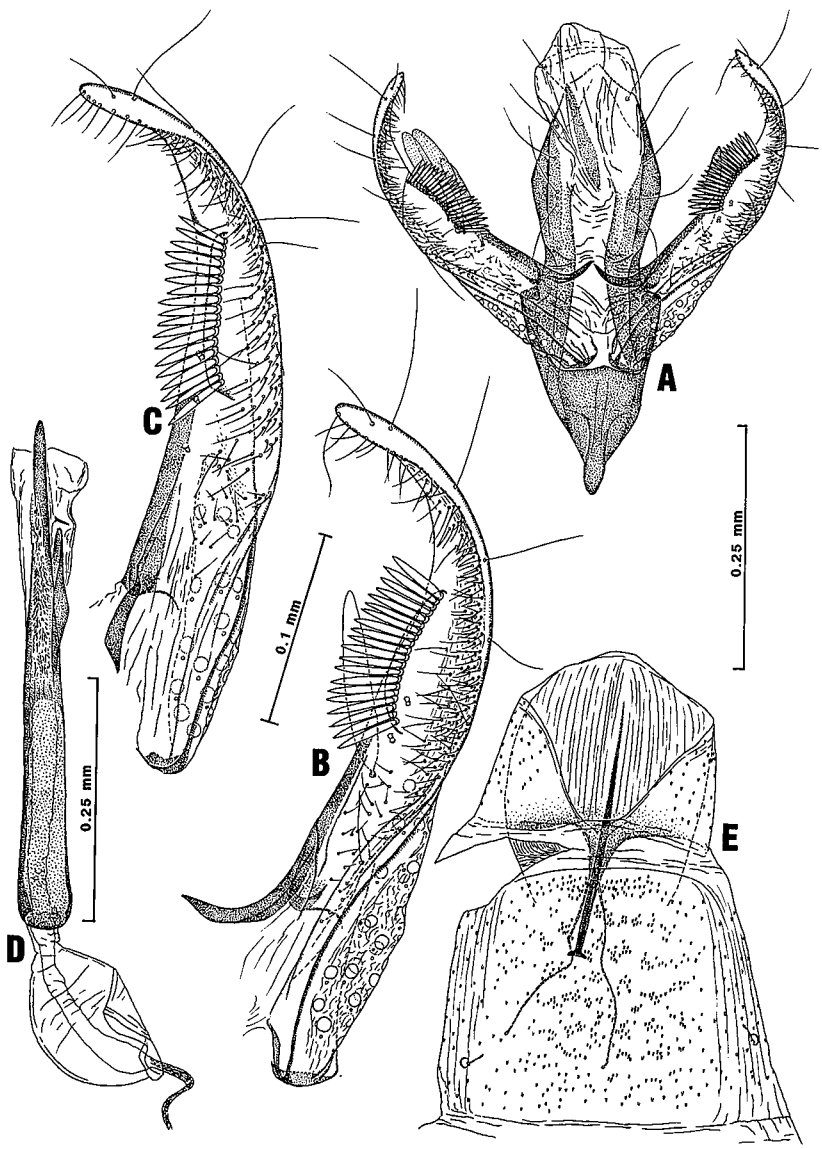


Fig. 22. *Chrysocercops pectinata* sp. nov. A: Male genitalia in caudal view, aedeagus omitted [Grc-5651, holotype] — B: Right valva enlarged [ditto] — C: Ditto [Grc-5621, Kg. Jeram, nr. Macang, Kelantan, Malaysia, em. 26/ix/1990, ex *Dipterocarpus grandifolius* (4061)] — D: Aedeagus [holotype] — E: Male seventh and eighth abdominal segments in ventral view [ditto].

3/5 of wing or just beyond blackish median fascia, expanding only to middle of wing-width, margined with a black spot outward; an ill-defined dark fascia placed at basal 4/5 of wing, usually detached from costa; a white costal spot placed just before apex of wing, margined with a black line inward, the black line usually extending to hind margin of wing; apex of wing occupied by an oval black spot; cilia stretched from black apical spot are blackish basally and whitish apically, those from termen shortly dark gray and shading into ochre towards wing-margin, and those from hind margin light gray; two dark fringe-lines convergent towards wing-apex. Hind wing gray, with cilia light gray.

Male genitalia (Fig. 22). Tegumen nearly spatulate in ventral view, but widest at middle, moderately long, with four to five slender setae along ventral margin of each lateral sclerite; subscaphium nearly lanceolate. Vinculum V-shaped, with lateral arms short, shorter than a half length of tegumen; saccus about as long as lateral arms, nearly triangular in ventral view, acuminate apically. Valva slender, smoothly narrowing towards curved cucullus without any gap between cucullus and sacculus; costa narrowly sclerotized and straight; a comb with 18 to 20 lanceolate teeth which are arranged near costal margin from basal 1/3 to 2/3 of valva as seen in the members of the genus *Acrocercops*; three large scales occurring on outer surface opposite the comb in addition to usual long androconial scales; many slender setae occurring on inner surface mostly near ventral margin. Aedeagus about 1.5 times as long as valva, straight, tapering towards sharp apex, with a narrow projection protruded from middle and reaching apical 1/4; vesica with an acute spine-like cornutus at apical 1/4 of aedeagus and many minute needle-shaped ones arranged from middle to apex of aedeagus; ductus ejaculatorius short, globose. (Two preparations examined.)

Female genitalia (Fig. 21 : B). Apophyses anteriores about as long as apophyses posteriores. Ostium bursae moderate in opening size, abruptly tapering cephalad; sclerotized antrum short, about 1/5 as long as seventh abdominal sternite, narrowly ring-shaped, but slightly dilated cephalad. Ductus bursae narrowly tubular, very long, about 3 times as long as seventh sternite, with its caudal 1/3 well sclerotized, but the sclerotization gradually weakened cephalad. Corpus bursae about 1/2 as long as ductus bursae, lined with minute comb-like spinules on its median area, especially densely around signum, which is oblong, moderate in size, and lined with many thorn-like spines. (One preparation examined.)

Specimens examined. 2♂♂ & 1♀. Holotype: ♂, Kg. Jeram, near Macang, Kelantan, Malaysia, em. 28/ix/1990, ex *Dipterocarpus grandifolius* (4061), Gen. sl. no. Grc-5651, deposited in FRIM. Paratypes: 1♂, with same data as in holotype except for date emerged, 26/ix/1990, in EIHU; 1♀, Beserah F. R., Kuantan, Pahang, Malaysia, em. 27/viii/1990, ex *D. grandifolius* (3853), in EIHU.

Distribution. Malaysia (Malay Peninsula).

Food plant. *Dipterocarpus grandifolius* Blanco (Dipterocarpaceae).

Diagnosis. *C. pectinata* is easily distinguished from the other members of the genus by the unique colour-pattern of the fore wing (see Fig. 31 : D), by the large comb of the valva, and by the caudally sclerotized ductus bursae.

Notes. *C. pectinata* is isolated from any other members of the genus in the simple valva with a comb similar to that of the species belonging to the genera *Acrocercops* and *Dekeidoryxis*. However, the venation of the fore wing, the structure

of the pregenital segments, the structure of the female genitalia and fundamental colour-pattern of the fore wing show that it undoutedly belongs to the genus *Chrysocercops*. The valva with comb(s) seems to have independently evolved in some genera of the *Acrocercops*-group such as *Acrocercops, Dialectica, Spulerina, Artifodina, Monocercops, Dekeidoryxis, Dendrorycter* and *Chrysocercops*; not all of these genera are closely related to each other.

I have missed to take notes on the leaf-mine of *C. pectinata* and to keep any herbarium specimen with the mine.

Acknowledgements

I wish to make grateful acknowledgements to the following authorities and persons. The authorities of His Majesty's Government of Malaysia and His Majesty's Government of Nepal permitted and supported the projects mentioned in Introduction; in these projects I have participated as a member to collect leaf-mining Microlepidoptera. Dr. Tho Yow Pong of the Forest Research Institute of Malaysia, Kuala Lumpur, and Dr. K. C. Sharma of the Department of Agriculture of the Nepalese Government, Kathmandu, promoted to realize our collecting trips in their countries. The authorities of the Herbarium Section of Nepalese Government, Godawari, and Mr. K. M. Kochummen, exbotanist at the Forest Research Institute of Malaysia, kindly identified the food plants of gracillariid insects. All the members of the projects kindly helped me in various ways during the trips in Malaysia and Nepal.

References

Ashton, P. S. 1988. Dipterocarp biology as a window to the understanding of tropical forest structure. Ann. Rev. Ecol. Syst. 19: 347-370.

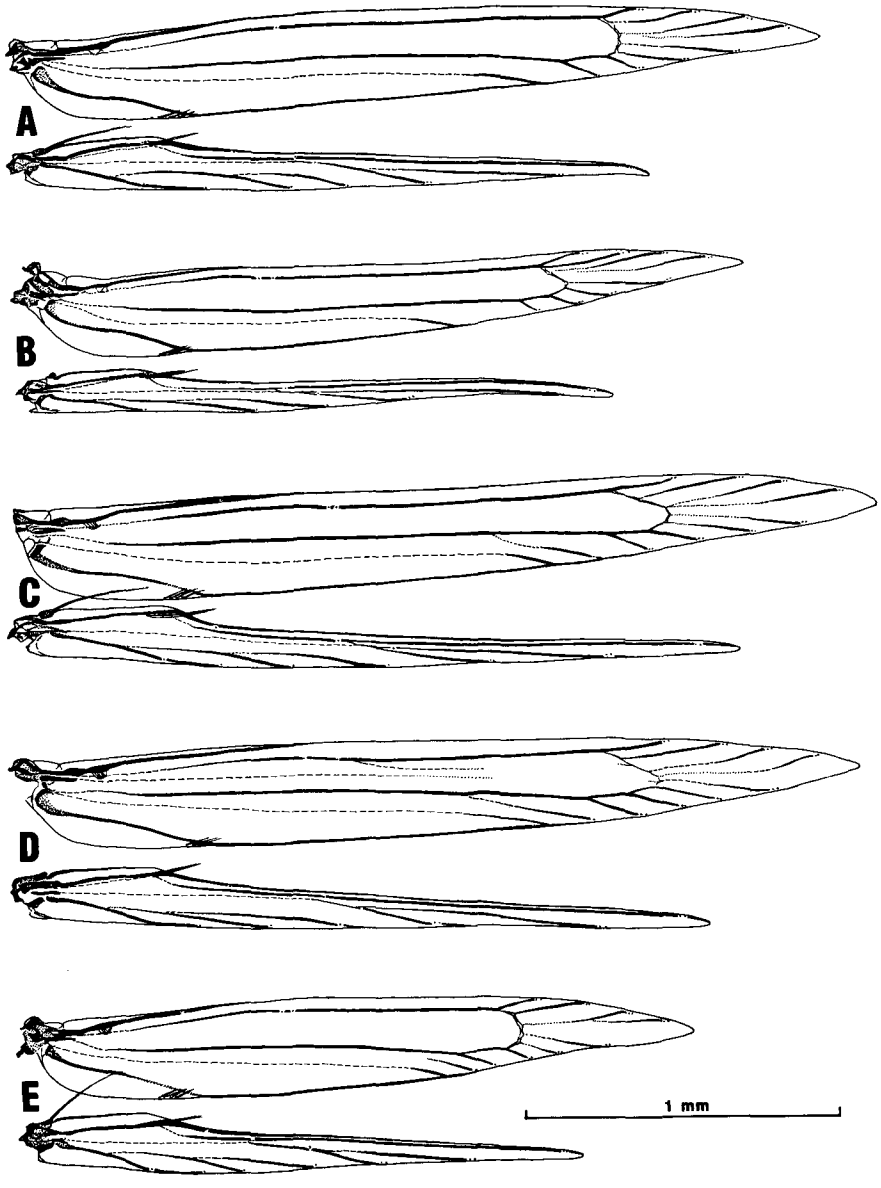
Baus, A. 1936. Die Reduktion der Flügel und Flügelsinneskuppeln bei Lepidopteren. Z. Morph. Öekol. Tiere, Berlin 32: 1-46.

Good, R. 1969. The geography of the flowering plants, 4th impression. xvi+518 pp. Longman, Green and Co. Ltd., London.

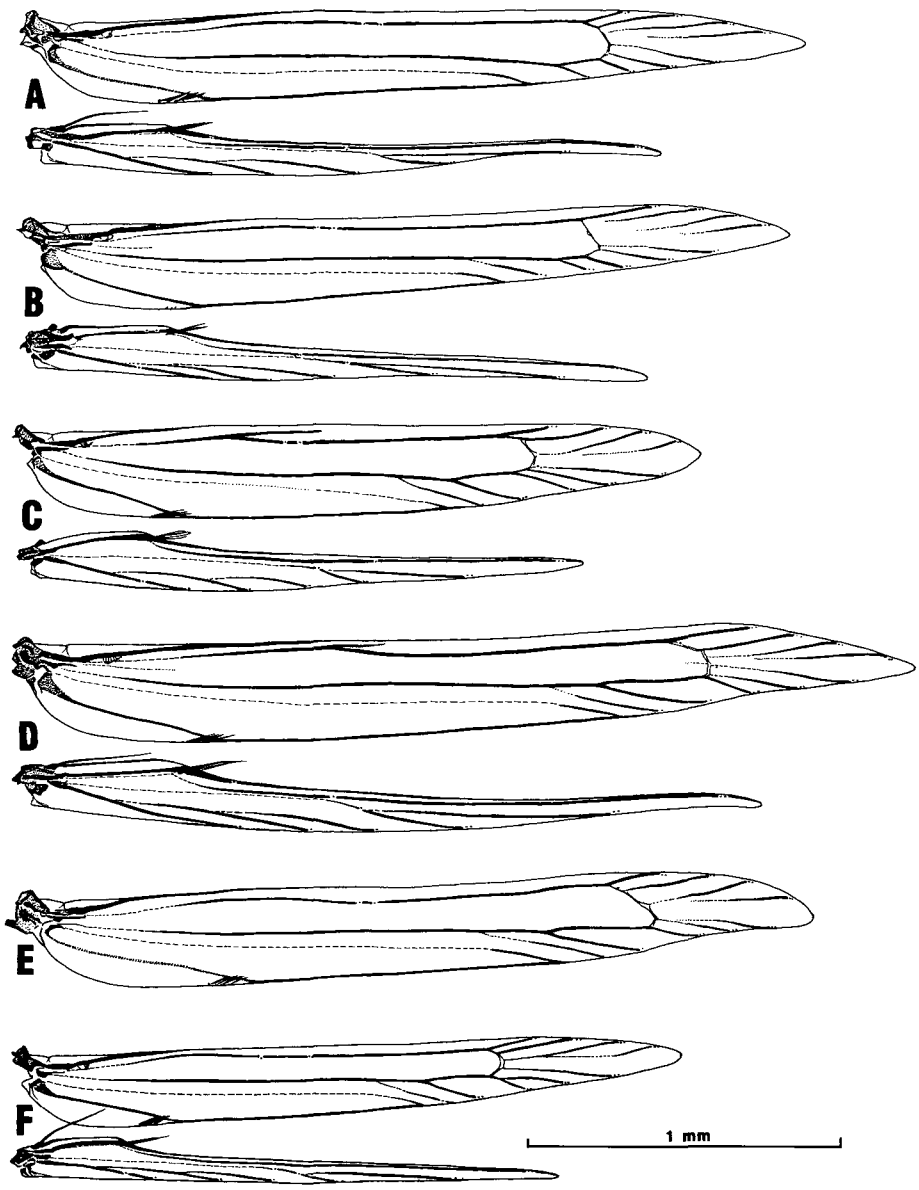
Kumata, T. 1989. Two new genera related to *Acrocercops* (Gracillariidae, Lepidoptera), with five new species from the Oriental Region. Ins. matsum. n. s. 42: 47-82.

Kumata, T., Kuroko, H. & Ermolaev, V. P. 1988. Japanese species of the *Acrocercops*-group (Lepidoptera: Gracillariidae), Part I. Ins. matsum. n. s. 38: 1-111. Part II. Ditto 40: 1-133.

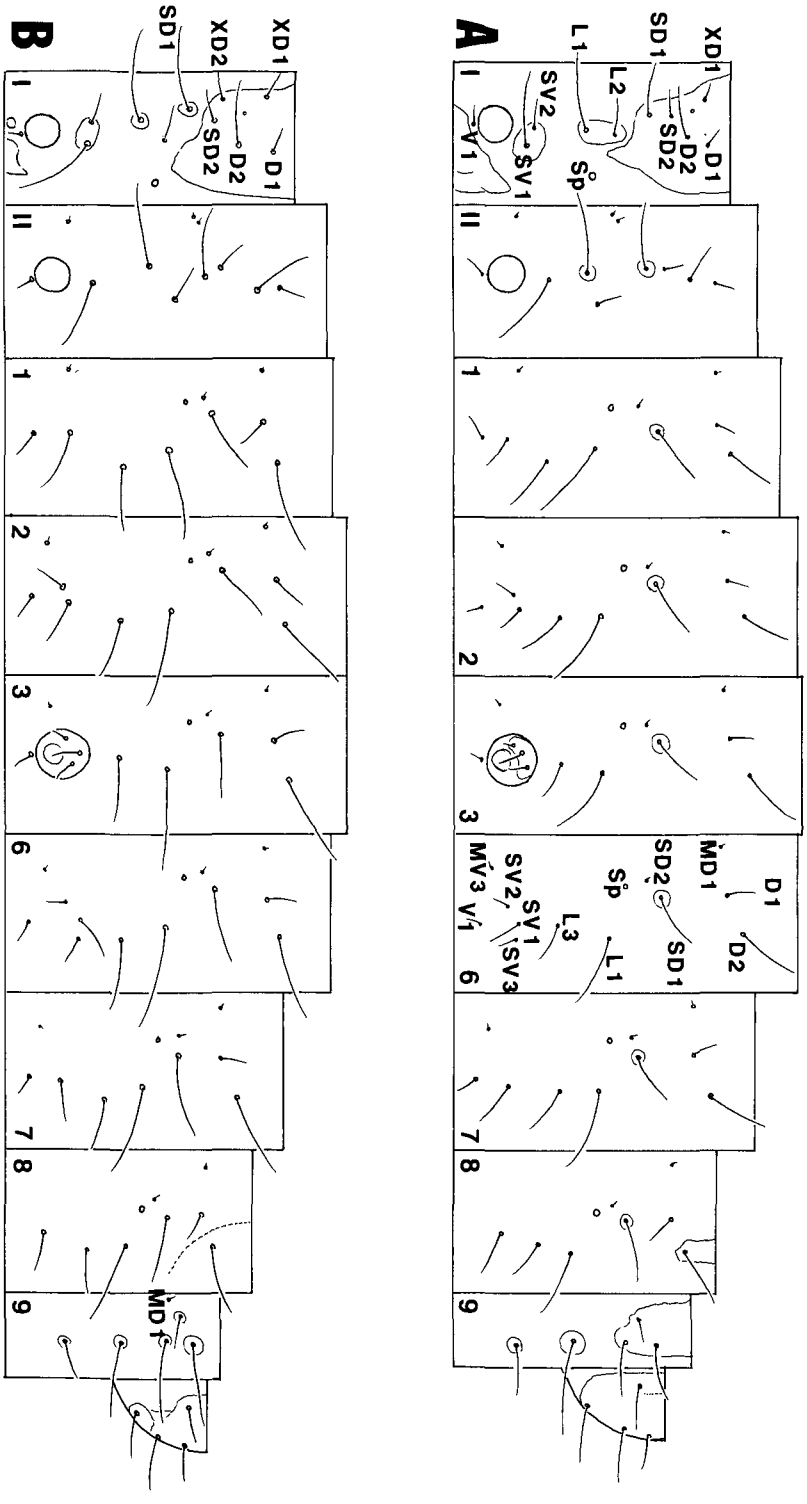
Symington, C. F. 1943. Foresters' manual of dipterocarps. Malayan Forest Records, 16, reprinted 1974. xliii+244 pp., 114 pls. Penerbit Universiti Malaya, Kuala Lumpur.



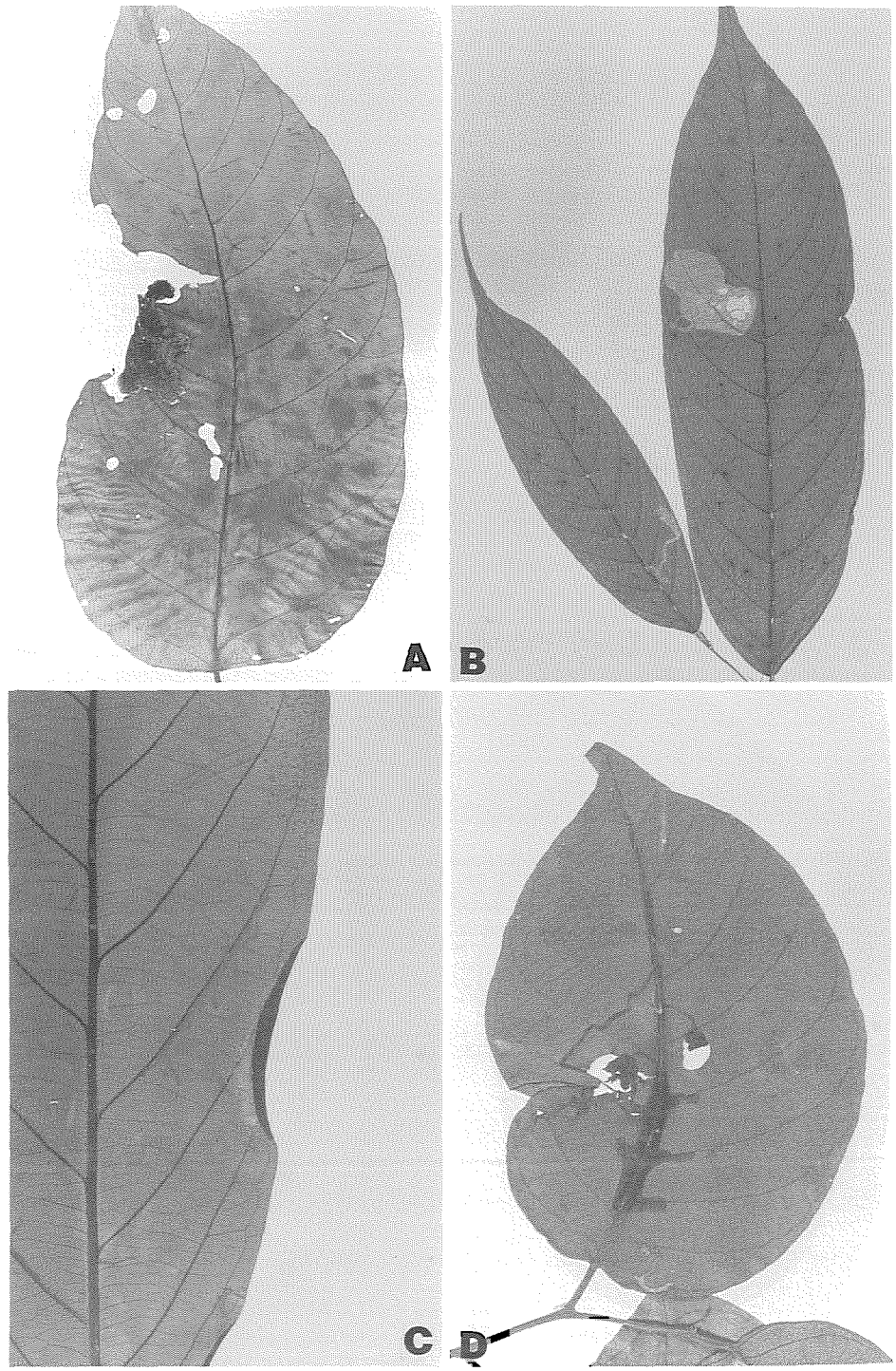
Pl. I : Fig. 23. Wing venation of *Chrysocercops* spp. A : *C. argentata* sp. nov. [♂, Grc-5655, Nepal, ex *Shorea robusta*] — B : *C. leprosulae* sp. nov. [♂, Grc-5646] — C : *C. vaticae* sp. nov. [♂, Grc-3846] — D : *C. azmii* sp. nov. [♀, Grc-5656] — E : *C. lithocarpiella* sp. nov. [♀, Grc-5649].



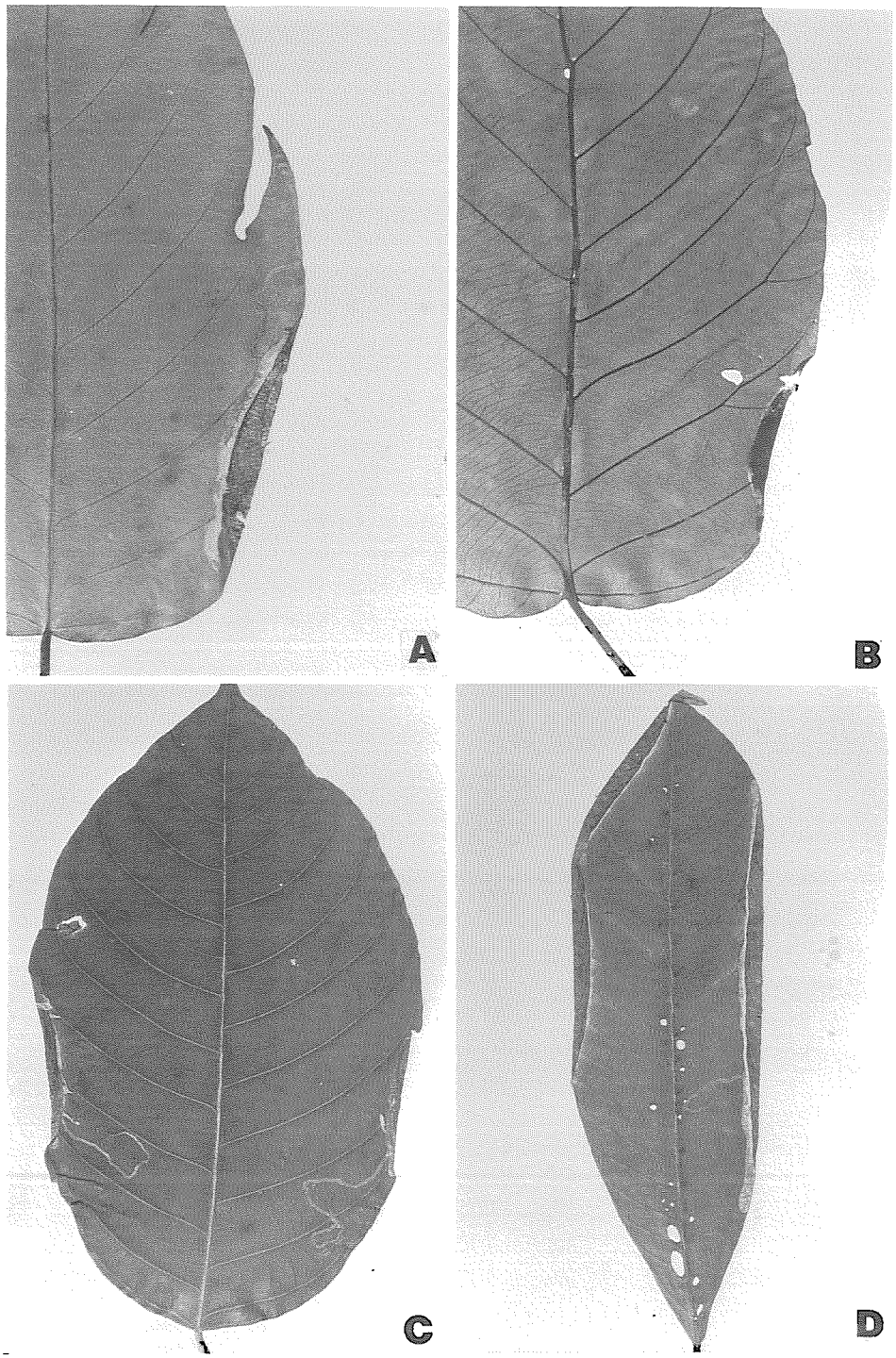
Pl. II : Fig. 24. Wing venation of *Chrysocercops* spp. A : *C. squamosa* [♂, Grc-5658] — B : *C. shoreae* sp. nov. [♂, Grc-5648] — C : *C. malastigmata* sp. nov. [♀, Grc-5657] — D : *C. thapai* sp. nov. [♀, Grc-5659] — E : *C. malayana* sp. nov., fore wing [♀, Grc-3847] — F : *C. pectinata* sp. nov. [♂, Grc-5621].



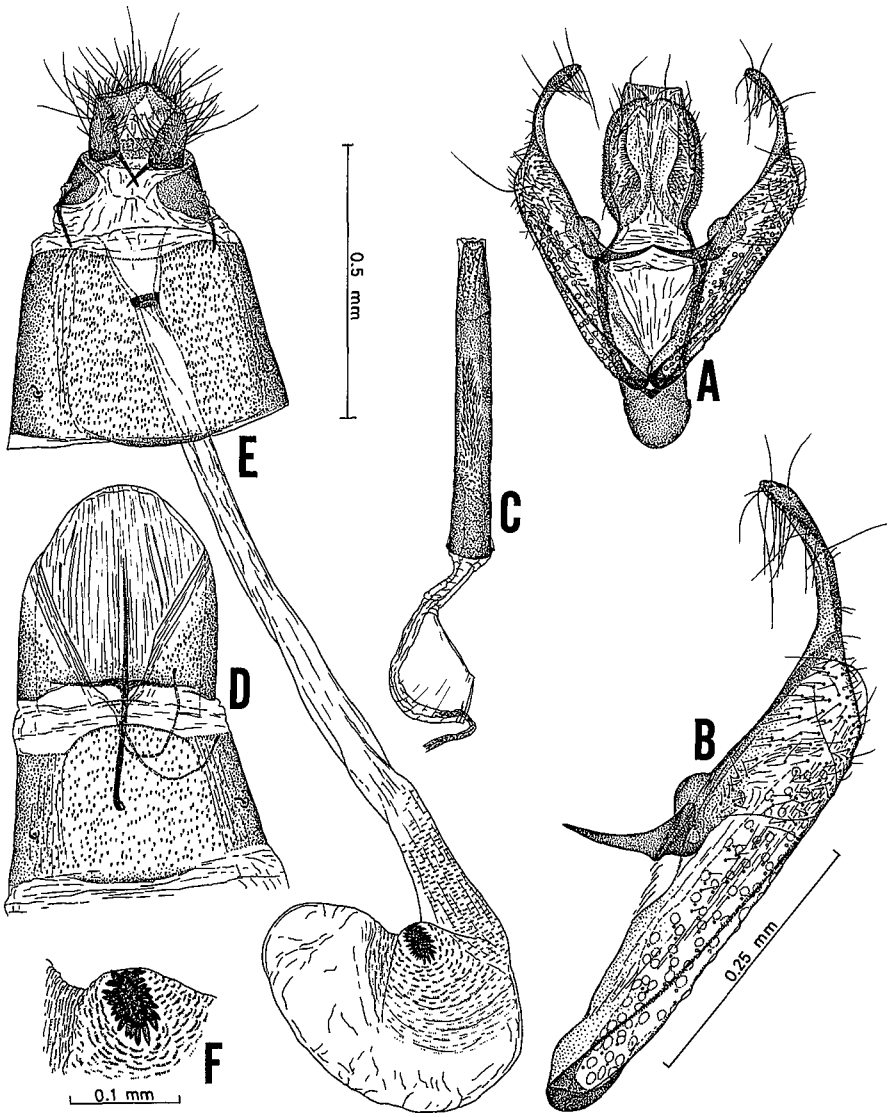
Pl. III : Fig. 25. Body chaetotaxy of last instar larvae of *Chrysocercops* spp. A : *C. azmii* sp. nov. [breeding no. 4132] — B : *C. malayana* sp. nov. [breeding no. 2779, ex *Shorea bracteolata*].



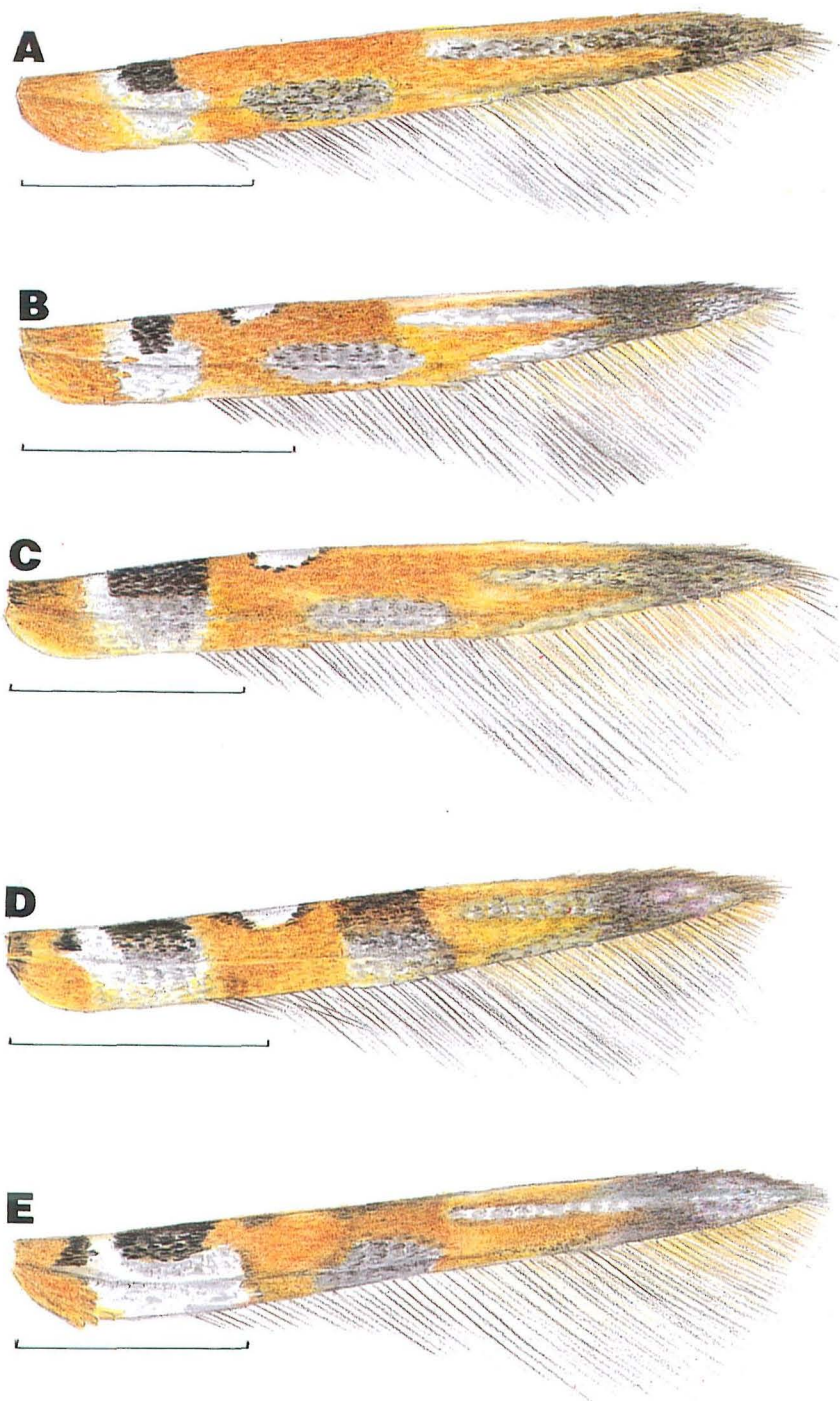
Pl. IV : Fig. 26. Mines of *Chrysocercops* spp. A : *C. argentata* sp. nov. on *Shorea robusta* (upper side) [breeding no. Npl-473] — B : *C. neobalanocarpi* sp. nov. on *Neobalanocarpus heimii* (upper side) [breeding no. 2846] — C : *C. azmii* sp. nov. on *Shorea maxonia* (lower side) [breeding no. 4132] — D : ? *C. hopeella* sp. nov. on *Hopea nutans* (upper side) [breeding no. 3866].



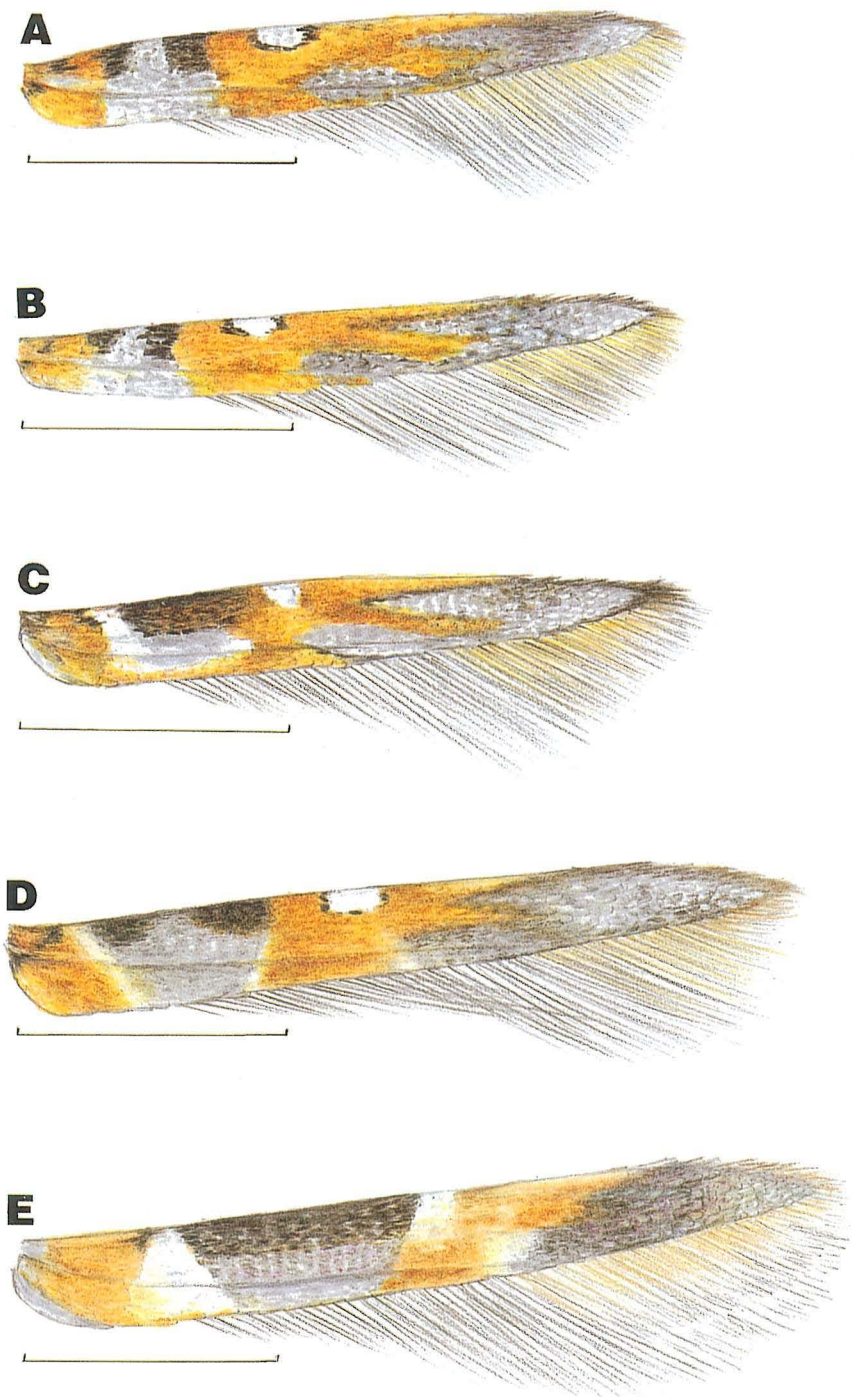
Pl. V : Fig. 27. Mines of *Chrysocercops* spp. A : *C. shoreae* sp. nov. on *Shorea materialis* (lower side) [breeding no. 3747] — B : *C. thapai* sp. nov. on *Shorea robusta* (lower side) [breeding no. Npl-306] — C : *C. malayana* sp. nov. on *Shorea bracteolata* (upper side) [breeding no. 2779] — D : ? *C. malayana* sp. nov. on *Shorea ovalis* (upper side) [FRIM, Kepong, Selangor, Malaysia, 7/viii/1986].



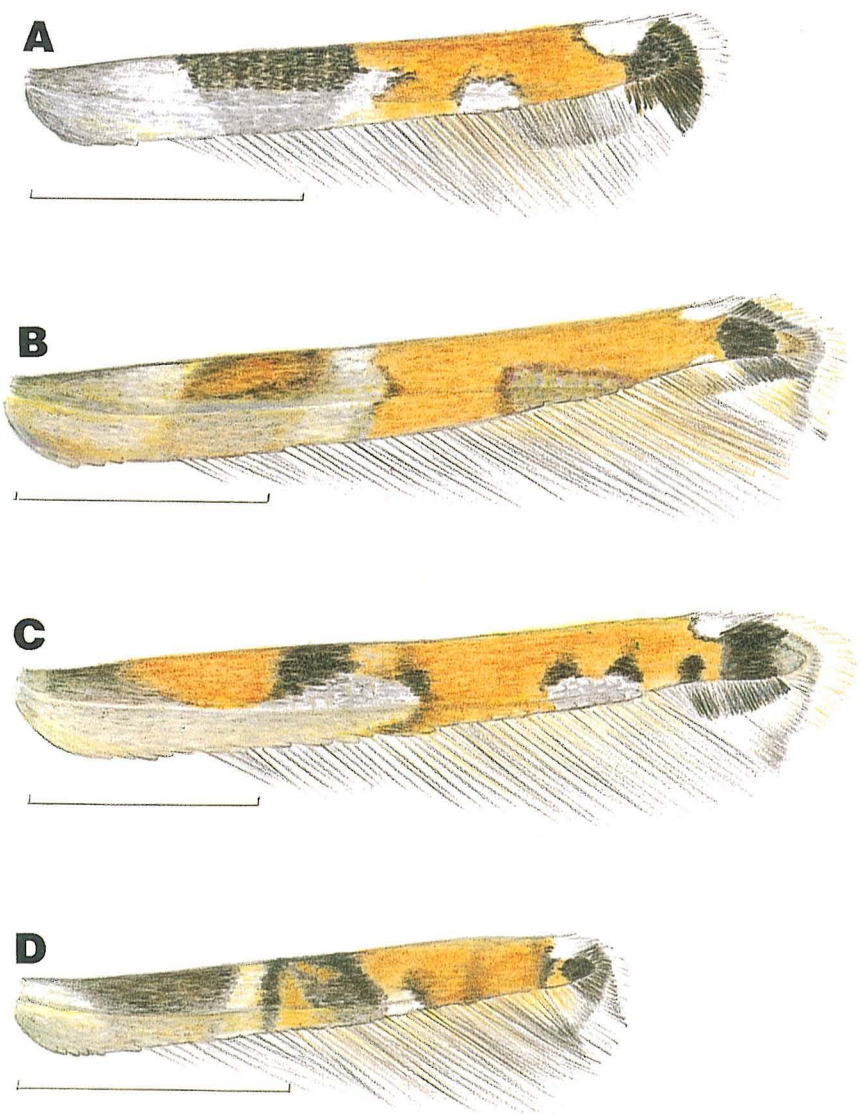
Pl. VI: Fig. 28. *Chrysocercops castanopsidis* Kumata et Kuroko. A: Male genitalia in caudal view, aedeagus omitted [Grc-1812, holotype] — B: Right valva enlarged [ditto] — C: Aedeagus [ditto] — D: Male seventh and eighth abdominal segments in ventral view [ditto] — E: Female genitalia in ventral view [Grc-1814, paratype] — F: Signum enlarged [ditto].



Pl, VII : Fig. 29. Fore wings of *Chrysocercops* spp. A : *C. argentata* sp. nov. [Nepal, ex *Shorea robusta*] — B : *C. leprosulae* sp. nov. — C : *C. castanopsidis* Kumata et Kuroko — D : *C. vaticae* sp. nov. — E : *C. azmii* sp. nov. (Scale, 1 mm.)



Pl. VIII : Fig. 30. Fore wings of *Chrysocercops* spp. A : *C. neobalanocarpi* sp. nov. — B : *C. hopeella* sp. nov. — C : *C. lithocarpiella* sp. nov. — D : *C. squamosa* sp. nov. — E : *C. shoreae* sp. nov. (Scale, 1 mm.)



Pl. IX : Fig. 31. Fore wings of *Chrysocercops* spp. A : *C. melastigmata* sp. nov. — B : *C. thapai* sp. nov. — C : *C. malayana* sp. nov. — D : *C. pectinata* sp. nov. (Scale, 1 mm.)